



# UWR Rainwater (RoU) Standard

**Version 8.2**

**Date: 21/10/2026**

Concept & Design: Universal Water Registry

[www.uwaterregistry.io](http://www.uwaterregistry.io)





The objective of this Universal Water Registry Rainwater Offset Unit Standard (UWR RoU Standard or Programme) is to drive unutilized water harvesting, recharge and conservation efforts, defined as the actions taken for capturing/recycling/reusing unutilized sources of water that is socially and culturally equitable, environmentally sustainable and economically beneficial, achieved through on site or catchment project activities. Building capacity and removing barriers to accessing finance is fundamental to accelerate climate change adaptation.

Users of this methodology understand their own water use, catchment context and shared concerns in terms of water governance; water balance; water quality; Important Water-Related Areas (IWRAs); Water, Sanitation and Hygiene (WASH), and then engage in meaningful individual and collective actions that benefit people, the economy and nature. In all project activities under this methodology, the end use of the water must either be consumption, utilization, recycling with gainful end use, groundwater recharge or protection of freshwater related ecosystems.

The UWR RoU Standard shares several principles with the [Volumetric Water Benefit Accounting \(VWBA\) 2.0](#) framework, including the importance of understanding local water challenges, quantifying measurable water benefits, documenting calculation methods and data sources, monitoring project performance, and communicating outcomes transparently. VWBA 2.0 offers voluntary, principle-based, and nonprescriptive guidance that is applicable to a broad spectrum of water stewardship activities.

UWR will always intend to strengthen the RoU methodology by incorporating relevant frameworks such as VWBA 2.0 principles and methods, among others where appropriate, to the project activity and local context. The RoU Standard remains the governing document for project eligibility, RoU quantification, verification, issuance and registry requirements.

The application of VWBA-derived approaches shall be documented in the applicable methodology or project documentation. Any modifications, limitations or additional UWR requirements shall be identified explicitly. Alignment with VWBA principles shall not be represented as formal adoption, endorsement or certification by the authors of VWBA 2.0.

The UWR RoU Standard challenges the notion of using hydrological basins as the basic organizational focus and looks at how water (and other vectors) actually move — a view that suggests that a “water harvesting/conservation/recharge system” could be a city, an ecosystem, a farmer’s field or a factory setting within closed boundaries. As observed and documented in various studies, water security plans need to consider a new approach that includes water resources on ground and underground. Communities most often do not make the connection between surface and ground water.

The UWR RoU programme has direct people's involvement in planning and management of water at the local level giving them ownership over their natural resources to create water security plans which is at the crux of any demand-driven approach to water conservation which . This is at variance with the supply-driven approach where communities are mere receivers of water supply.

In simpler systems, the hydrological basin may or may not be the “system” in many places or won’t be in the near future. A hydrological-only focus obscures or confuses what is actually happening within the project boundary (e.g. aquifers, often exist in recharge and discharge basins that have complex relationships with what is happening on the surface with rivers and lakes).

Ground water usage laws and their enforcement has been poor in India. The policies do not reach the end users who are expected to be key stakeholders, in a way they would understand its provisions and their role. In the absence of a withdrawal strategy in projects, the water users slip back to their original condition, which is a strain on resources spent by the government. Many a times, the policy imperatives for convergence get lost in achievement of targets at the local level. There is limited promotion of available technologies like the GIS and remote sensing, where water security plans encompassing a watershed have been made for a large number of villages. Yet the water security concept in its true sense has not become institutionalized enough.

The UWR RoU programme and methodology employs a broad monitoring and accounting framework that is expected to capture the impacts of various water recharging, harvesting, recycling and conservation practices aimed at unutilized water savings and enhancing groundwater supply stocks. Projects may apply a combination of practices as set out in this document.

***While this program was developed for India and Asia,*** countries and regions outside Asia, will also be considered into the program taking the spirit (goal) of UN SDG 17 into account, especially water conservation and recharge projects that encourage and promote effective public,

public-private and civil society partnerships while building on the experience and resourcing strategies of such partnerships. The UWR RoU Standard respects every country's policy and leadership space that establishes and implements policies for sustainable water and groundwater development. We also recognize that the unfolding water crisis is universal.

The UWR RoU Standard treats water as a community asset. Therefore, support to community via water credits, including that for capacity building at different levels is provided. Water credits (RoUs) serve as incentives to support behavior change in favour of sustainable water use and management at various levels.



Universal  
Water Registry

## The water crisis was forecast. Why were we still waiting for the crisis to act?

Water credits could have helped turn  
a crisis into a preparation plan.

Water security isn't just about  
responding to drought. It's about  
financing the solutions before  
we run short.

- Rainwater harvesting
- Water reuse
- Groundwater recharge
- Conservation & efficiency

Real projects.  
Measurable outcomes.  
Stronger communities.



**UWR**  
Water Credits for a  
More Resilient Tomorrow

The background image shows a woman in a red sari walking across a cracked, dry landscape towards a small pool of water under a sunset sky.

# Background

Water is an essential pillar of sustainable development. Water resources and ecosystems provide food (SDG 2) and energy security (SDG 7), contribute to human and environmental health (SDG 3), and are essential for manufacturing industries (SDG 9). Integrated water resources management can contribute to tackling poverty (SDG 1) and inequality (SDG 10), enhance economic development (SDG 8), develop urban settings (SDG 11) and support the protection of ecosystem services (SDGs 6 for freshwater, 14 for marine and 15 for terrestrial). Yet, the sustainability of water-related ecosystems is threatened by climate change (SDG 13), excessive pollution (SDGs 6 and 14) and overexploitation. Hence the need to reduce deteriorated water quality and water scarcity and avoid water-related conflicts (SDG 16) as well as regulate consumption and production (SDG 12) for future generations. Additionally, given the interlinkages of the water sector with all aspects of national economies, policy coherence is crucial to ensure synergy and avoid trade-offs between and among economical activities.

Global events and examples have highlighted both the potential implications of water scarcity and the pathways to achieve water security. Recently, the worsening water crisis in Cape Town, South Africa, where the city hovered dangerously close to ‘Day Zero’ (when it could run out of water), had caused water rationing and civil strife in the city in 2018, combined with the global examples of countries managing water effectively in a long-term sustainable manner, such as that of Israel, have ensured that the momentum around effective water management has been increasing and that the sector is being accorded a high priority in the national policy agenda of countries.

Roughly half of the world’s population currently experience severe water scarcity for at least some part of the year due to climatic and non-climatic drivers. Risks in physical water availability and water-related hazards will continue to increase by the mid-to long-term in all assessed regions across the world, with greater risk at higher global warming levels. In small islands, groundwater availability is threatened by climate change. Changes to stream flow magnitude, timing and associated extremes are projected to adversely impact freshwater ecosystems in many watersheds by the mid-to long-term across all assessed climatic scenarios. At global warming of 4°C, approximately 10% of the global land area is projected to face increases in both extreme high and low river flows in the same location, with implications for planning for all water use sectors. Challenges for water management will be exacerbated in the near, mid and long term, depending on the magnitude, rate and regional details of future climate change and will be particularly challenging for regions with constrained resources for water management (*source: IPCC WGII Sixth Assessment Report 2022*).

Over 40% of Europe’s water footprint lies outside its border, and 50% of the UK’s footprint is from unsustainable sources. The moral case for rapid action to ensure that our water footprint is

sustainable and resilient is clear, and this action can only succeed in partnership with producer countries and through engagement with companies.

While this program and standard is aimed at all unutilized water conservation and recharge efforts (with or without treatment) worldwide, its genesis lies in India and hence, the protocol established by the Universal Water Registry (UWR) keeps projects established within India in mind as the basis of development and standardisation of this methodology associated with the program.

This methodology also addresses Managed Aquifer Recharge (MAR) processes, defined as a holistic approach to various groundwater recharge methods including artificial recharge, aquifer recharge and rainwater harvesting. This term is widely used in water policies and official papers in recent times. MAR under this methodology also refers to water conservation, wastewater recycling and desalination projects.

There is a general acknowledgment that humanity's Carbon Footprint (CF) and Water Footprint (WF) have surpassed sustainable levels and that society must make efforts to reduce them, but it appears to be quite difficult to establish unambiguous and agreed upon maximum sustainable levels for WFs. **Hence, this methodology and protocol is aimed at the voluntary water conservation market and addresses the potential to quantify unutilized water units from water conservation, harvesting, restoration and recharge projects.** Asia has achieved impressive growth in economic and social welfare during the last decades. Good water management and human capital development remain vital to support economic growth and increase overall social wellbeing in Asia and the Pacific, especially after the coronavirus disease 2019 (COVID-19) pandemic. Despite the achievements in Asia and the Pacific (home to 60% of the world's population), 1.5 billion people living in rural areas and 0.6 billion in urban areas still lack adequate water supply and sanitation (source: AWDO 2020).

Environmentally conscious consumers from water-rich regions of the world pay more attention to their indirect water consumption embodied in the goods they consume (e.g. cotton for jeans or coffee) than the direct water usage, which in relative terms, may have a much smaller environmental impact. **Rainwater offset Units (RoUs)** as envisioned under this Standard, are generated for water that can be harvested repeatedly with negligible environmental impacts – a condition that is analogous to sustainable water use.

Take a single T-shirt for example. It takes 712 gallons of water to produce one, mostly because of the water needed to grow the cotton. A quarter-pound hamburger requires 462 gallons of water if you take into account the water required to grow the cattle feed ([source](#)).

Today India is a water stressed nation, standing on the brink of an acute water crisis: a fact that can be seen in its per-capita water availability which is less than 1,500 cubic meters a year. Water, the very element that supports life, seems to be drying out of this country. Hence, it's

more important than ever before to provide an incentive to conserve water and various recharging methods, both traditional and modern, that help conserve the unutilized water resources in India. First, an incentive directly encourages conservation of water. Second by creating a price for water, it can visibly demonstrate the effects of saving it. If a conserver can trade their water savings for cash, they will be much more likely to invest in conservation technologies and better yet, encourage other parties to undertake similar initiatives.

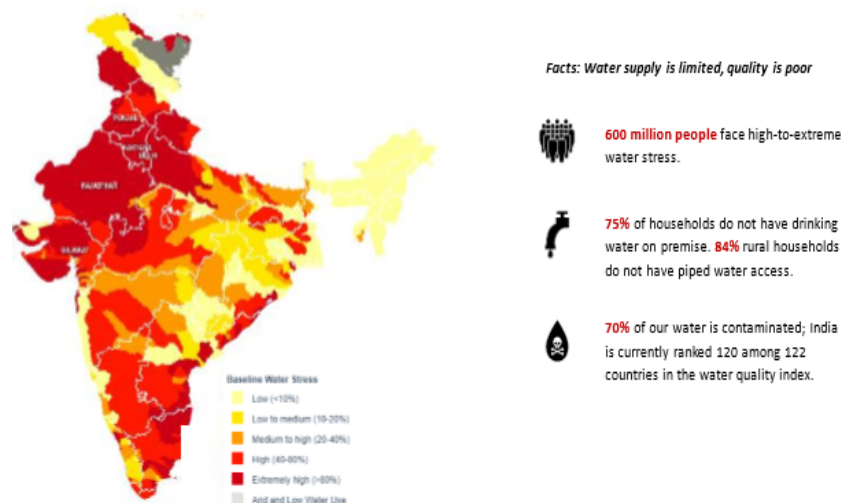
There is no clear relationship between water's price and its value, the price often reflects attempts for cost recovery and not the value delivered. There is also no real incentive to recharge groundwater or install rainwater harvesting systems at a scale needed to address the current water crisis.

India is suffering from the worst water crisis in its history and millions of lives and livelihoods are under threat. Currently, 600 million Indians face high to extreme water stress and about two lakh people die every year due to inadequate access to safe water. The crisis is only going to get worse. By 2030, the country's water demand is projected to be twice the available supply, implying severe water scarcity for hundreds of millions of people and an eventual ~6% loss in the country's GDP. As per the report of National Commission for Integrated Water Resource Development of MoWR, the water requirement by 2050 in high use scenario is likely to be a milder 1,180 billion m<sup>3</sup> (BCM), whereas the present-day availability is 695 BCM. The total availability of water possible in country is still lower than this projected demand, at 1,137 BCM. Thus, there is an imminent need to deepen our understanding of our water resources and usage and put in place interventions that make our water use efficient and sustainable (*source: Composite Water Management Index (CWMI), 2018*).

**RoUs serve as an important tool in rebalancing the water dynamics of the region by incentivizing and monetizing all efforts to harvest and conserve rainwater and to methods that recycle and/or reuse wastewater and/or to projects that convert an unutilized water source into usable water. The establishment of RoUs leads to a water-rich environment.**

India is undergoing the worst water crisis in its history. Already, more than 600 million people<sup>13</sup> are facing acute water shortages. Critical groundwater resources – which account for 40% of our water supply – are being depleted at unsustainable rates.

**Figure 6: Baseline water stress in India<sup>14,15,16</sup>**  
Ratio of total withdrawals and total flow (2010)



Droughts are becoming more frequent, creating severe problems for India's rain-dependent farmers (~53% of agriculture in India is rainfed<sup>17</sup>). When water is available, it is likely to be contaminated (up to 70% of our water supply), resulting in nearly 200,000 deaths each year<sup>18</sup>. Interstate disagreements are on the rise, with seven major disputes currently raging, pointing to the fact that limited frameworks and institutions are in place for national water governance<sup>19</sup>.

Source: Niti Aayog, 2018

The assessment of ground water extraction in India is typically carried out considering the Minor Irrigation Census data and sample surveys by the State Ground Water Departments. The Total Annual Ground Water Extraction of the entire country for the year 2017 has been estimated at 248.69 bcm. The agriculture sector is the predominant consumer of ground water resources. About 89% of total annual ground water extraction i.e. 221.46 bcm is for irrigation use. Only 27.24 bcm is for Domestic & Industrial use, which is about 11% of the total extraction. In the states of Arunachal Pradesh, Delhi, Goa, Jammu & Kashmir, Kerala, Mizoram, Nagaland, Sikkim and Tripura and Union Territories of Andaman & Nicobar Island, Chandigarh, Dadra & Nagar Haveli, and Lakshadweep the ground water extraction for domestic & industrial uses is more than 40%. The overall stage of ground water development in the country is 63% (2020).

**Global Scenario:** In 2022, over 50% of global catchment areas experienced deviations from normal river discharge conditions. Most of these areas were drier than normal, while a smaller percentage of basins displayed above-normal or much-above-normal conditions. When compared to 2021, the scenario was somewhat similar, however, in 2021 a greater number of rivers

experienced dry to normal conditions. Water inflow into a selection of major reservoirs in 2022 followed the trend in general discharge – more than 60% of reservoirs saw below-normal or above-normal inflow.

In South America, significant portions of Argentina, Paraguay, Uruguay, Chile and southern Brazil recorded below-normal to much-below-normal river discharge. In the La Plata river basin, drought conditions established since 2020 persisted into 2022 and resulted in impacts on agriculture, inland water navigation, energy production and water supply. Lower-than-normal precipitation totals continued to late September 2022, which exacerbated the already low river discharge.

In North America, the central and western regions of the United States showed below-normal to normal river discharge records; record low levels were observed in the Mississippi Basin in 2022, affecting barge movements along its waterway. The drought conditions in this area, which began in 2019, continued through 2022. In contrast, the Yukon (Alaska) and Mackenzie (Canada) river basins had much-above-normal and above-normal river discharge, respectively. Across the Winnipeg river basin the discharge was above average in 2022. More than half of the gauged tributaries across the basin set new all-time flow records and flooding lasted for months, causing extensive damage and states of emergency in the provinces of Ontario and Manitoba (Canada) and the state of Minnesota (United States).

The discharge conditions in the Horn of Africa were much below normal in 2022. The area continued to suffer the longest and the most severe drought event on record in 2022, which started in 2020, with much-below-normal annual discharge conditions. The extraordinary run of four successive dry rainfall seasons in the Horn of Africa, which may be partially attributed to human-driven warming, sea surface temperatures in the Indian Ocean and La Niña, was compounded by the arrival of a fifth rainy season in 2022 marked by scarce rainfall. The Congo River and the entire catchment of the Nile River in Central Africa exhibited reduced river discharge. In contrast, the Niger basin, and almost the entire territory of South Africa, including the Orange river basin, showed above-normal river discharge. The Niger basin and the east coast of South Africa (KwaZulu-Natal and Eastern Cape provinces) suffered major flood events in 2022.

Throughout Central and Western Europe, river discharge levels were below normal, as a result of extreme heat and drought in 2022. Basins draining the Alps and Carpathians into rivers such as the Danube, Loire, Rhine and Po, exhibited significantly low levels during the summer of 2022. Rivers in southern Norway and southern Sweden were also affected and exhibited below-normal discharge conditions. The entire territories of the Islamic Republic of Iran, Iraq, Syrian Arab Republic, Afghanistan and Myanmar, and the Amu Darya and Syr Darya basins in Central Asia saw below-normal and much-below-normal discharge conditions in 2022. Also, in the southern

part of China, the Yangtze River, affected by drought and prolonged heat, reached record-low water levels<sup>53</sup> affecting almost 5 million people.

India, and especially Pakistan, were hit by severe flooding in 2022 caused by very high precipitation concentrated during the monsoon period. The Godavari and Krishna Rivers in the southern part of India exhibited much-above-normal river discharge in 2022. In Pakistan, the lower part of the Indus basin exhibited much-above-normal river discharge in 2022.

Eastern Australia, particularly the Murray–Darling river basin, exhibited above-normal river discharge conditions. In fact, several flood events occurred in Australia in 2022. Malaysia, Indonesia and the Philippines saw above-normal river discharge conditions, as well as the North Island of New Zealand. The river discharge conditions of the South Island of New Zealand remained near normal (*source: WMO-No. 1333 © World Meteorological Organization, 2023*).

Women and girls are bearing the brunt of water shortages and a lack of sanitation around the world, hindering the economic and social development of poorer countries, [the UN has warned](#).

Women are responsible for collecting water in more than 70% of rural households that do not have access to mains water across the developing world. Women and girls collectively spend 250m hours a day collecting water globally.

The climate crisis is exacerbating the problem, according to a new report from the UN. A 1degree © rise in temperature reduces incomes in female-headed households by 34% more than in male-headed ones, while also causing women’s weekly labour hours to increase by an average of 55 minutes relative to men’s. The [World Water Development report](#) found that data on women and girls was hard to come by, as many countries and international institutions do not collect statistics broken down by sex. But it is clear women have been severely disadvantaged in access to water for health, cooking, sanitation and agriculture, and that countries were moving too slowly to address the issues. In 2024, the latest year for which data is available, more than 2.1 billion people lacked safely managed drinking water and 3.4 billion lacked [safely managed sanitation](#). Women are also under-represented in decisions made over water rights relating to agricultural land, which are often linked to property rights. Women are discriminated against in land tenure rights in many countries, with men taking ownership of twice the amount of land.

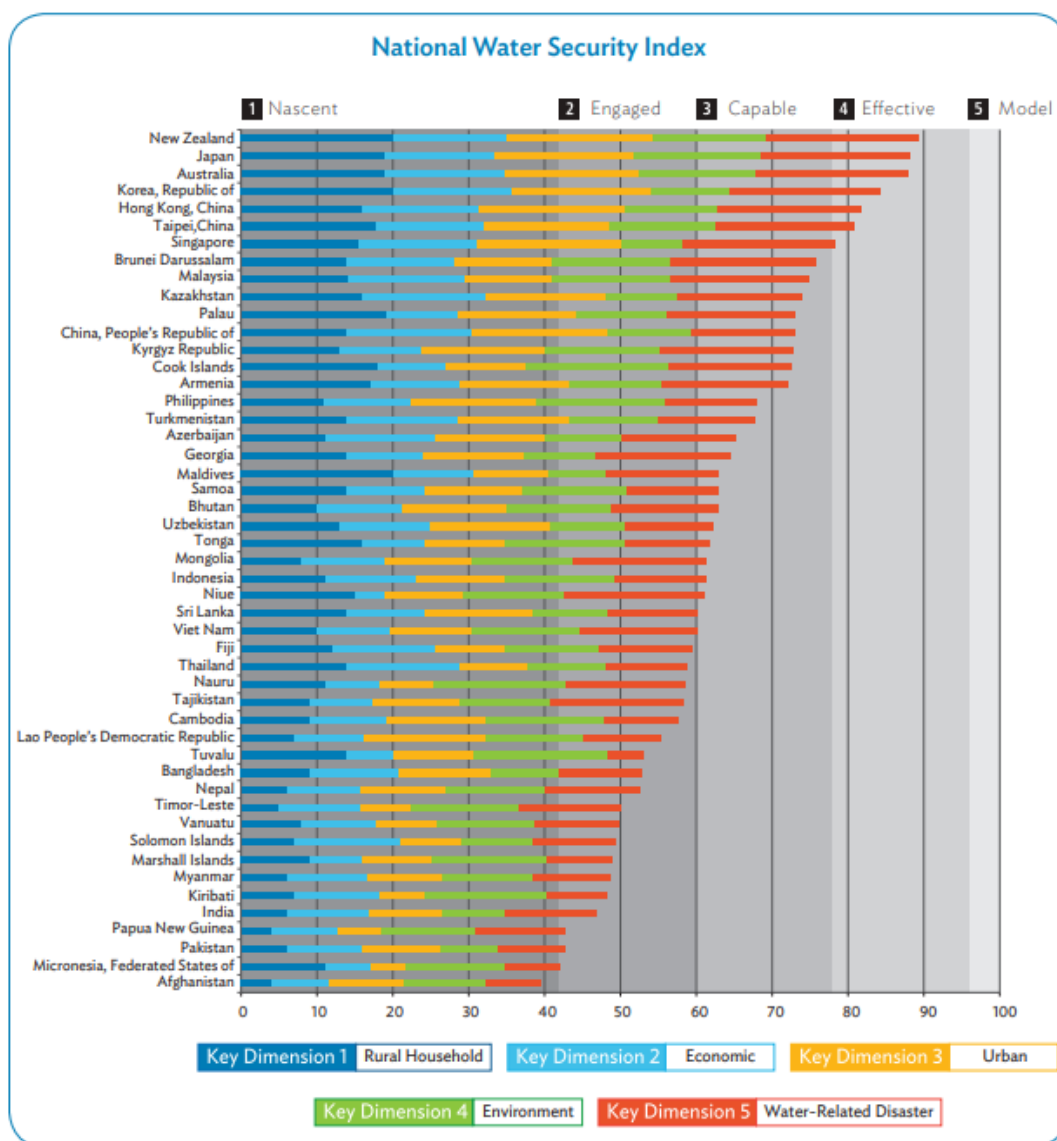
**Similar Initiatives:** The UWR RoU programme is unique, however, the concept is similar to the current approach involving the generation of Stormwater Retention Credits (SRCs) in Washington District, USA, which are given for projects that reduce harmful stormwater runoff by installing green infrastructure (GI) or by removing impervious surfaces. Installing new, voluntary GI in the Municipal Separate Storm Sewer System in Washington generates SRCs which provide the greatest water quality benefits to the District’s water bodies. The price for such SRCs are controlled by the regulator and SRCs can be purchased on the open market. The system is designed on a cap and trade mechanism.

# Methodology Key Elements

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Typical Project<br/>Scopes</p> | <ul style="list-style-type: none"> <li>(i) measures which enhance the sustainable yield in areas where over-development has depleted the aquifer and implementing soil moisture agricultural measures that reduce the need for irrigation by optimizing water use and retention in the soil, drip irrigation and smart irrigation system measures.</li> <li>(ii) measures for conservation and storage of excess surface water for future requirements and conservation of freshwater related ecosystems and wetland protection</li> <li>(iii) measures that improve the quality of existing ground water through dilution with rainwater runoff</li> <li>(iv) measures that remove bacteriological and other impurities from <i>seawater</i>*, sewage/wastewater contaminated water bodies or other contaminated water bodies, so that water is made suitable/fit for re-use and recycling purposes. The water bodies are outside the project's fenced boundary.</li> <li>(v) conservation measures taken to recycle and reuse water, spentwash, wastewater etc across or within specific industrial processes and systems.</li> </ul> |
| <p>Sustainability Goals</p>       | <p>SDG 6, 11, 12, 13</p> <p>No water quality requirements or restrictions are applicable at this time for the implementation of project activities which use this methodology. The project developer shall provide evidence that they are not engaged in profiteering from the project outcomes but rather any revenue is used to enhance access to conserving water and/or recharging water systems and/or clean, reliable drinking water and / or improving groundwater availability within the project's boundary of influence. Desalination systems must showcase brine management systems check on marine ecosystems and must be powered by renewable energy to use this</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| UNDP Human Development Indicator                          | <p>methodology.</p> <p>All projects using this methodology must be <b><i>ideally</i></b> located in a country or region with a recent UNDP Human Development Indicator below 0.900 (source: <a href="http://hdr.undp.org/en/data">http://hdr.undp.org/en/data</a>) <b><u>However, countries and regions with higher HDI's will also be considered</u></b> taking the goal of UN SDG 17 into account, especially water conservation and recharge projects that encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <p>National Water Security Index, ADB</p> <p>Quantity</p> | <p>All projects using this methodology <b><u>are ideally below</u></b> the NWS score of 60 and NWSI equal or lower than 2 (<math>NWSI \leq 2</math>). However, since the UWR RoU Standard must also respect every country's policy and leadership space that establishes and implements policies for sustainable water and groundwater development, <b><u>projects above the NWS score of 60 can also use</u></b> the methodologies outlined in the UWR RoU Standard and be eligible for RoUs under the programme.</p> <p>(source:<a href="https://www.adb.org/sites/default/files/publication/663931/awdo-2020.pdf">https://www.adb.org/sites/default/files/publication/663931/awdo-2020.pdf</a>)</p> <p>Annual RoU threshold is limited to <b>1,000,000 RoUs/year</b> (1 million RoUs/yr or 1000,000,000 liters/yr) over the entire crediting period <b>except in specific cases under Scope IV*</b>.</p> <p>(i) <i>*Project activities (Scope IV or Scope 4) that involve voluntary measures to remove bacteriological and other impurities from, sewage waste water or contaminated water bodies, such that the water from the contaminated water body is made suitable/fit for re-use and recycling purposes can claim RoUs upto 2,000,000/year (2 million RoUs/year or 2000,000,000 liters/yr) over the entire crediting period. The contaminated water bodies are outside the project's fenced boundary.</i></p> |

*\*Desalination plants are eligible only if the plant is powered by renewable energy and clear documentation exists on brine management and no net harm to the local marine ecosystem.*



## National Water Security Stages

| NWSI | NWS Score    | NWS Stage | Description                                                                                                                                                                                                                                                                                                                                         |
|------|--------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5    | 96 and above | Model     | <p>All people have access to safe, affordable, and reliable drinking water and sanitation facilities.</p> <p>Economic activities are not constrained by water availability.</p> <p>Environmental governance is good, and pressure on aquatic ecosystems is limited.</p> <p>Water-related risks are acceptable and relatively easy to deal with.</p> |
| 4    | 78–96        | Effective | <p>Nearly all people have access to affordable safe drinking water and sanitation facilities.</p> <p>Economic water security is high.</p> <p>Environmental governance is generally acceptable, and attention is given to ecological restoration.</p> <p>There are systematic commitments to reduce disaster risk.</p>                               |
| 3    | 60–78        | Capable   | <p>Access to safe drinking water and sanitation facilities is improving.</p> <p>Economic water security is moderate.</p> <p>Environmental governance is moderate, with clear pressure on the ecosystem.</p> <p>There are some institutional commitments to reduce disaster risk.</p>                                                                |
| 2    | 42–60        | Engaged   | <p>A significant majority of rural and urban households have access to basic water supply but less to sanitation.</p> <p>Economic water security is low.</p> <p>Environmental governance is moderate, with severe pressures on aquatic ecosystems.</p> <p>Progress in achieving disaster risk security is low.</p>                                  |
| 1    | 0–42         | Nascent   | <p>A low proportion of rural and urban households have access to basic water supply and sanitation.</p> <p>Economic water security is low.</p> <p>Environmental governance is poor, with significant pressures on the aquatic ecosystems.</p> <p>Hardly any attention is given to disaster risk reduction.</p>                                      |

NWS = national water security, NWSI = National Water Security Index.

Source: Asian Development Bank.

# Metrics

Water credits is a new and innovative market, that has been designed on the voluntary carbon credits principle and work in conjunction with India's Green Credits incentivize to support a wide range of environment-positive activities beyond only carbon emissions reduction.

As with any new market, demand is expected to grow with capacity building and information dissemination over time, similar to the carbon markets.

**Water credits are not related to water rights trading**, since there is no physical delivery of water in the UWR ecosystem. It's a first-of-its-kind instrument that seeks to value and reward multiple water ecosystem conservation services to allow green projects to achieve optimal returns beyond just known products like carbon credits. **Water rights trading on the other hand**, is a market-based system where parties buy, sell, or lease legal rights to use water from a specific source (e.g., river, aquifer). **Water rights trading** aims to reallocate water more efficiently in response to scarcity, economic demand, or environmental needs.

All projects using this methodology will be required to maintain a ratio of 1m<sup>3</sup> of unutilized water or wastewater recharged/conserved/recycled to be eligible to generate 1 RoU

Rainwater offset credits = 1 RoU = 1000 liters of rainwater/unutilized water captured or recycled & reused from systems (freshwater ecosystems included) and measures undertaken by individuals and entities per year. RoUs are tradable digital certificates representing a quantifiable amount of water conserved, harvested, saved or recharged-typically by an entity voluntarily **and showcases the avoidance and extraction of an equivalent quantity of groundwater or known freshwater resource** under this standard. Water credits are also not usage or water entitlements rights.

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 Water Credit = 1 RoU | An activity or measure undertaken to harvest or conserve 1000 liters (1 m <sup>3</sup> ) of un-utilized water which prevents an equivalent quantity of groundwater or water resource from being exploited or extracted each year. It does not confer water rights or license to the actual water prevented from being extracted or saved into a water source (e.g. waterway, catchment dam, spring, soak or aquifer) and does not involve the actual physical delivery of water. |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Vintage year:** Similar to the carbon vintage year concept, RoUs can be classified as the year in which the conservation, recharge or recycling of water took place and quantified or mined for the monitoring period **June 01, YYYY to September 30, YYYY or January 01, YYYY to**

**December 31, YYYY** depending on the project activity (e.g *RWH systems could use the June-September monitoring period, while wastewater recycling or desalination systems would adopt the January -December monitoring period for RoU estimation*).

**Earliest Vintage Start Date (UWR RoU Standard):** January 01, 2014 onwards.

**Commissioning Dates:** Not applicable. Project activities can be commissioned anytime in the past. They must currently be operational or should have showcased operation or capture/reuse/recycle of unutilized water or rainwater in any of the preceding years (2014 at the earliest). Auditors and verifiers will audit the projects for operation/data parameters and installation dates as applicable during verification.

**Data:** Since the RoU is dependent on the flow rate and liters captured, this can either be done through installed flow meters or scientific quantification based on archived rainfall data available from government sources and appropriate run-off factors.

**Reference:** Users are encouraged to use the Indian Department of Water Resources Information System (<https://indiawris.gov.in/wris>) for water and rainfall data information.

As per the 2017 assessment of Dynamic Ground water resources, the total Annual Ground Water Recharge for the entire country (India) has been assessed as 432 billion cubic meter (bcm) and total natural discharges works out to be 39 bcm. Hence, the annual extractable Ground Water Resources for the entire country is 393 bcm.

RoUs can be banked indefinitely, meaning that buyers can purchase them and save them for use on future projects or for any compliance or ESG or NetZero credentials reporting purposes. Buyers of RoUs do not assume any liability for maintaining the RoU-generating project activity. RoUs are generated and issued ex-post.

**Crediting Period:** Not applicable. RoUs can be claimed for the “Lifetime of the Project Activity.”

**Quantity:** All eligible project activities must limit their annual RoU threshold to **1,000,000 RoUs/year** (1 million RoUs/yr or 1000,000,000 liters/yr) over the entire crediting period (except activities as specified under the additional updated Scope IV or Scope 4 guidance below). If a project activity goes beyond the limit of 1 million RoUs/year, in any year of the crediting period, the water credits claimed by the project activity during this particular year will be capped at 1 million RoUs/yr for that year during the crediting period.

**For the avoidance of doubt, no RoU/water credit project activity under this UWR protocol/standard can claim water credits over the threshold of 1 million RoUs in each year of the crediting period except in the following cases:**

- *Project activities (Scope IV or Scope 4) that involve voluntary measures undertaken to remove bacteriological and other impurities from, sewage/wastewater contaminated water bodies or*

*contaminated water bodies, such that the water is made suitable/fit for re-use and recycling purposes, can claim RoUs upto **2,000,000/year (2 million RoUs/year or 2000,000,000 liters/yr)** over the entire crediting period. The contaminated water body or sewage wastewater stream/s, **must be located outside the project boundary to claim such eligibility.***

## Use Case Principle

The human appropriation of freshwater resources in terms of volumes of water consumed and polluted is termed as a water footprint (WF). Prior to the establishment of this Protocol/Methodology, it was acknowledged that the WF in one catchment could not be compensated for by offsetting activities to reduce the WF in another catchment. However, since the methodology being introduced here quantifies conservation, harvesting and recharging activities, it becomes the first methodology to award water offset units in terms of RoUs that can be used for offsetting purposes since it introduces an unutilized source of water, hence potentially compensating the WF of **virtual water** in supply chains, products and services worldwide. In the classic top-down approach, the WF of the people living in a province, nation or river basin is calculated as the total use of water resources in the area under consideration plus the gross virtual water import into the area minus the gross virtual water export. Virtual water import is the volume of water used in other countries to make goods and services imported to and consumed within the country considered. Virtual water export is the volume of water used domestically for making export products which are consumed elsewhere. Hence, the basis of any WF is the consumption aspect defined as the quantity of water consumed. The idea that a water offset for a WF should always occur in the catchment where the WF is located is not applicable and perhaps misplaced, since virtual water is already being imported and exported. Blockchain companies and commodity companies are already creating smart contracts, with a sort of “nutrition label” for every commodity that’s been bought and sold to enable provenance. The supply chain industry for commodities is moving towards ESG tags for CO2 emissions, female participation, data on whether it was involved in modern slavery and water pollution among other ESG parameters. The RoU when tokenized on blockchain can be attached/wrapped around such a blockchain system seamlessly showcasing water recycled, recharged and conserved. **The purpose of this standard is to encourage more entities and people to take on water conservation, recharging and recycling measures to protect the depletion of groundwater reserves worldwide. More importantly, this protocol serves to create a new incentive mechanism for such actions if used in conjunction with blockchain technology and for purposes other than WF purposes. It does not necessarily need to follow the centralized mechanism such as the “polluter pays compliance allowance system” or the “cap and trade” water entitlement market. Blockchain technology, decentralized finance and oracle pricing mechanisms can be designed to reward anyone willing to buy and sell the RoUs once tokenized or converted to smart fungible or non-fungible tokens/contracts.**

Environmentally conscious consumers from water-rich regions of the world can finally compare their WFs to their carbon footprint estimates for CO2 emission or energy consumption.

Some financial regulators have already taken a lead in sustainable finance in relation to environmental instruments (water credits or environmental attributes such as carbon credits) to be classified as “financial instrument,” that can be regulated on exchanges.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><i>What is MitiW</i></b>                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <i>MitiW is a digital commodity backed 1:1 by verified water conservation credits. Each token represents one cubic metre (1,000 litres) of conserved, harvested, recharged, or recycled water, verified by Universal Water Registry’s third-party registry auditors. It’s issued by Miti-X, an Indian fintech (Universal Miti-X Private Limited), in partnership with UWR.</i>                                                                                 |
| <i><a href="#">More info here</a>. Think of it less like a DeFi yield product and more like buying a discounted unit of a real, scarce commodity — closer in spirit to a gold or carbon-credit token than to a lending or staking product.</i>                                                                                                                                                                                                                 |
| <b><i>What MitiW is NOT</i></b>                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <i>This matters more than what it is. MitiW does not pay yield, interest, staking rewards, or any form of APY. There’s no cash flow to holders. If you’re coming from staking or lending RWA products (tokenized T-bills, credit pools, liquidity vaults), recalibrate: this is a price-exposure instrument, not an income instrument. Any claim that MitiW “earns yield” is inaccurate — treat it as a red flag if you see it marketed that way anywhere.</i> |

The above information is for informational purposes only and does not constitute investment advice. MitiW is an appreciation-dependent digital commodity with no yield, staking, or interest mechanism. Past performance of referenced indices is not indicative of future results. Do your own research.

# Definitions

**Aquifer Recharge:** defined as the process of water being added to a groundwater system comprised of a geological structure or formation, or part thereof, permanently or intermittently permeated with water or capable of transmitting water'. Water introduced or recharged into an aquifer becomes 'groundwater.'

**Aquifer** A geological structure or formation, or part thereof, permeated with water or capable of being permeated permanently or intermittently with water and transmitting water. Geological unit containing groundwater. It must have sufficient porosity to hold water and sufficient permeability to allow easy flow. Porosity is created by the space between grains of rock, and by cracks and fissures. Aquifers occur on many scales, ranging from small and local units to 100s of square kilometers. Thickness ranges from one meter to 100s of meters. A water table (or unconfined) aquifer lies just below the ground surface, and is vulnerable to pollution. A confined aquifer lies below an impermeable rock layer (such as clay) which helps protect it from surface pollution.

**Aquifer storage and recovery (ASR):** The recharge of an aquifer via a well for subsequent recovery from the same well.

**Aquifer storage transfer and recovery (ASTR):** The recharge of an aquifer via a well for subsequent recovery from another well, to allow a minimum residence time in the aquifer before recovery.

**Aquitard:** A geological layer that has low permeability and confines or separates aquifers.

**Borehole:** A vertical below-ground installation to abstract groundwater. It is drilled (or bored) and lined with metal or plastic tubes to keep it open, and to protect against surface/near surface pollution. At depth, the tubes are slotted or filtered to allow water in but to prevent ingress of silt, sand or rock particles. In hard consolidated rock, the intake sections may be unlined. Borehole diameter is typically 10 to 30 cm, and depths range from a few meters to 100s of meters, with most less than 100 m. Colloquially, they are often called a well or water well (see water well). In South Asia, they are called tubewell. Water is usually abstracted with an electrical submersible pump installed some meters below the water level with a pipe connection to the surface.

**Beneficial use:** A use of the environment or any element or segment of the environment which (a) is conducive to public benefit, welfare, safety, health or aesthetic enjoyment and which requires protection from the effects of waste discharges, emissions or deposits or of the emission of noise or (b) is declared in India's environment protection policy to be a beneficial use.

**Catchment:** The geographical zone in which water is captured, flows through and eventually discharges at one or more points. The concept includes both surface water catchment and

groundwater catchment. A surface water catchment is defined by the area of land from which all precipitation received flows through a sequence of streams and rivers towards a single river mouth, as a tributary to a larger river, or to the sea. A groundwater catchment is defined by geological structure of an aquifer and groundwater flow paths. It is replenished by water that infiltrates from the surface. It has vertical thickness (from a few meters to 100s of meters) as well as area. Depending on local conditions, surface and groundwater catchments may be physically separate or interconnected. “Catchment of origin” refers to a catchment, distinct from the site’s catchment(s), where a product or service is manufactured or sourced. It may be anywhere from an adjacent catchment to the other side of the world. Alternative terms are watershed, basin and river basin.

**‘Consumption,’** references in the WF industry currently refer to it as the as the loss of water from the available **ground–surface water body** in a catchment area, which happens when water evaporates, is incorporated into a product, or is transported to another catchment area or the sea. Consumption in case of this UWR Standard/Methodology refers to **sub-surface groundwater** resources being depleted and not recharged suitably to prevent future water disasters. Rainwater harvesting (RWH) and conservation, is a process of collecting, conveying, and storing the rainfall in an area for the beneficial purposes. Wastewater recycling and seawater desalination systems are also similar concepts mirroring RWH systems as an unutilized water source is being recycled or treated to replace freshwater or groundwater resources. The concept of virtual, or embedded, water was first developed as a way of understanding how water scarce countries could provide food, clothing and other water intensive goods to their inhabitants. The global trade in goods has allowed countries with limited water resources to rely on the water resources in other countries to meet the needs of their inhabitants. As food and other products are traded internationally, their water footprint follows them in the form of virtual water. For water-scarce countries it can sometimes be attractive to import virtual water (through import of water-intensive products), thus relieving the pressure on the domestic water resources. This happens, for example, in Mediterranean countries, the Middle East and Mexico. Northern European countries import a lot of water in virtual form (more than they export), but this is not driven by water scarcity. This potentially allows us to offset the WF of production/consumption, wherever they occur using RoUs. Hence, the consumption of water associated with a given product is usually not so much the water retained or held within the product itself but the water that was used to insure the production of this item (from agricultural irrigation for food, fibers or biofuels, process water for manufacturing or other indirect water consumption).

**Contaminated water body:** A water body that receives (or had received) untreated sewage, effluent discharge and/or industrial waste, and/or defined as ‘heavily polluted’ or “unfit for human consumption” by the authorities. This water body is located is outside the project’s fenced boundary.

**Disclosed** Making a document available to relevant stakeholders and in some cases, publicly available or publicizing its availability, such as on the UWR

**Discharge:** Water-related discharge from a site, including drainage, wastewater (effluent), used cooling water and irrigation surplus. The quality of discharged waters may range from good to polluted, depending on its origin, its use, and treatments applied.

**Effluent:** Water or wastewater discharged from a site after being used. It is a more specific term than discharge (ie., not including drainage or runoff). The quality of effluent may range from good to polluted, depending on its origin, its use, and treatments applied.

**Embedded/virtual water:** Water that was used in the production or creation of an item, but not contained within it. For a crop, it is the water it needed to grow (irrigated or rain-fed), taken up by its roots and lost via transpiration, and is usually 100's of times more than the water physically retained within the crop. It may also include water used to wash, process and transport it. For a manufactured item (eg. a car, computer), it is the water used during its manufacture. For clothing, it includes the water to create the raw material (eg. cotton or wool) as well as that used in manufacturing. Alternative terms are 'virtual water' and 'water footprint'. There are a range of methods and approaches to evaluating embedded water. Some include total water use, others only net water use. Some include the principal manufacture, others include the complete supply chain (eg. mining of raw materials).

**Evaluated** Having a documented and replicable process applied to monitor the implementation of the plan and related commitments and to make informed changes to the plan and its implementation. Implemented A process, procedure, or plan is carried out in order to achieve the intended result.

**Freshwater:** Freshwater plays a fundamental role in support of the environment, society and the economy. Ecosystems such as wetlands, rivers, aquifers and lakes are indispensable for life on Earth. Freshwater related ecosystems are also vital for directly ensuring a range of benefits and services such as drinking water and recreation, agriculture and energy, habitats for aquatic life forms and natural solutions for water purification and climate resilience. Freshwater related ecosystems can be defined as “a dynamic complex of plant, animal, and microorganism communities and the non-living environment dominated by the presence of flowing or still water, interacting as a functional unit.” (*Dickens and McCartney 2019; MEA 2005*). SDG target 6.6 aims for the protection and restoration of water-related ecosystems and includes indicator 6.6.1 which is framed around the monitoring of different types of freshwater related ecosystems including lakes, wetlands, groundwater and artificial water bodies such as reservoirs. In the indicator RoU methodology, reservoirs are also included as part of freshwater related ecosystems. Although reservoirs are not traditional ecosystems requiring protection and restoration, they contain significant freshwater in many countries and were therefore included in the UWR RoU Standard.

**Green infrastructure** – also sometimes called natural infrastructure, or engineering with nature, green infrastructure intentionally and strategically preserves, enhances, or restores elements of a natural system among others, and combines them with gray infrastructure to produce more resilient and lower-cost services.

**RoU projects** capture and/or conserve and/or recycle/recharge unutilized rainwater/wastewater/seawater to persons/systems/processes and/or groundwater and/or artificial or natural subsurface storage systems which would not be possible without the project intervention by UWR members.

**Rainwater** is bacteriologically pure. free from organic matter and soft in nature.([source](#))

**Rain Water Offset Unit or Credit (RoU)** is a volumetric measure of water harvested or conserved through project activities on UWR and expressed as m<sup>3</sup> or 1000 liters of water per year. *It is not a measure of the severity of the local environmental impact of water harvested or consumed and is not based on water quality or pollution parameters.* Increasing, the supply of unutilized rainwater to groundwater and/or for reuse or recycling of process wastewater streams or treatment of unutilized seawater for potable purposes is the challenge this standard aims to address through the creation of RoUs.

RoUs are tradable digital certificates representing measures or activities undertaken towards a quantifiable amount of water conserved, harvested, saved or recharged-typically by an entity voluntarily **and showcases the avoidance and extraction of an equivalent quantity of groundwater or known freshwater resource** under this standard. Water credits are also not usage or water entitlements rights

RoUs are independent of point of use treatment systems, such as water filters (e.g. membrane, activated carbon, ceramic filters), solar energy powered ultraviolet (UV) disinfection, solar disinfection, photocatalytic disinfection, pasteurization, chemical disinfection (e.g. chlorination), combined treatment approaches (e.g. flocculation plus disinfection).

The availability of source water, one of the prime requisites for ground water recharge, is basically assessed in terms of non-committed surplus monsoon run off, which as per present water resource development scenario is going or would have gone unutilised in the absence of the project activity.

Broadly speaking, the goal of assessing RoUs is to quantify efforts by human activities or specific products or projects involving capture of rainwater for groundwater recharge and/or conservation purposes related to recuse or recycling in a sustainable manner, including specific positive water project activities without any adverse impact to the environment or society.

RoUs are tangible environmental assets linked to sustainable water and wastewater project activities. By replicating carbon markets' successes while addressing water-specific challenges, UWR is in a position to showcase water credits as a mainstream asset class that:

- Mobilizes trillions in capital for water security.
- Aligns profit with planetary health.
- Empowers corporations, investors, and communities to value water as a finite, shared resource.

**Rainwater Harvesting Projects** (e.g rooftop rainwater harvesting systems or a series of small check dams, can be submitted to the Universal Water Registry (UWR) as Programmes of Activities (PoAs). A PoA could be composed of several component projects (CPs). The PoA developer can decide when and how to divide the programme into CPs. The decision may be to start a new CP in a new geographic area, for example to reflect differing conditions between that area and other CPs, or alternatively the choice of starting a new CP may be in order to allocate a new start date to different beneficiaries from those included in an earlier activity. The decision could also be made to differentiate activity using one technology/measure from activity using another technology/measure. However, a single CP may include more than one technology/measure and different geographical areas if needed if the underlying baseline and quantification measures are relevant to all the areas and technologies/measures.

The total number of RoUs generated by a PoA is the sum of the RoUs generated by each CP for that vintage year. Once a specified group of project owners have been included in a CP, they cannot later be included in another CP.

**Identified:** Having some form of evidence (paper, electronic, or other) of conformance. Information presented shall be at a frequency, level of accuracy and over a sufficient time period to enable meaningful conclusions to be reached in relation to the indicator. This includes having a documented process(es) to identify and document the attributes listed.

**Mapped:** Maps should preferably be in a digital format and be of a quality that enables an external party to identify the location, scale and physical properties of the attributes listed. A physical diagram could be accepted when deemed better fit for purpose than a map.

**Quantified:** Numerical information presented shall be at a frequency, level of accuracy and over a sufficient time period to enable meaningful conclusions to be reached in relation to the indicator. This includes having a documented process to quantify (i.e., numerically) and document the attributes listed.

**Groundwater:** Water below the surface of the Earth stored in pore spaces and fractures within rock or layers of sand and gravel (aquifers). In water resources management the term more specifically applies to water that can be extracted at a viable rate, quantity and quality for human

use (with or without treatment). Saline water or water contained in rocks of very low permeability is not conventionally considered groundwater.

**Injection well** A well that admits water into an aquifer, either by pumping or under gravity.

**Native groundwater** Groundwater that was present prior to recharge operations.

**Reuse** - Utilisation of water for domestic, commercial, agricultural or industrial purposes, which would otherwise be discharged to wastewater or stormwater systems.

**Best management practices** – Water efficiency measures that save a quantifiable amount of water, either directly or indirectly, and that can be implemented within a specific time frame.

**Water stewardship** - The use of water that is socially and culturally equitable, environmentally sustainable, and economically beneficial, achieved through an inclusive process with relevant parties that involves site- and catchment-based actions.

**With-project conditions:** The circumstances or points after a project is implemented that an organization or activity can use to evaluate progress or make comparisons.

**Without-project conditions:** The beginning points at which an organization or activity will be monitored and against which progress can be assessed or comparisons made.

# Data

Ground water levels are measured by the Central Ground Water Board, India four times a year during January, March/April/ May, August and November. The regime monitoring started in the year 1969 and currently has a network of 22730 observation wells, located all over the country. The premonsoon water level data is collected from all the monitoring stations during the months of March/ April/ May. For North eastern states premonsoon data is collected during March, since the onset of monsoon is normally observed in April. Similarly for Orissa, West Bengal and Kerala where monsoon appears early in May the monitoring is carried out during the month of April. For remaining states premonsoon monitoring month is May. Water levels during August are monitored to assess the impact of monsoon on the ground water resources. Post monsoon data collected during November reflects the cumulative effect of ground water recharge and withdrawal of ground water for various purposes. January water level data indicates the effect of withdrawal for rabi crops.

India exported 3,850,431 liters of water between 2015-16 and 2020-21 (April-November). India exported three categories of water in this period: Mineral water (2,378,227 liters), aerated water (602,389 liters) and natural and other water (869,815 liters). Most of this water in 2019-20, went to China. Beijing imported 63,580 liters of mineral water, 1,000 liters of aerated water and 20,000 liters of natural water. It imported the highest quantity of mineral and natural water. Other major imports of Indian water were to the Maldives (38,380 liters), United Arab Emirates (35,510 liters), Canada (33,620 liters) Singapore (33,460 liters), United States (31,730 liters), Qatar (25,900 liters) and Saudi Arabia (29,020 liters) ([source](#)).

The availability of unutilized source water, one of the prime requisites for ground water recharge or conservation, is basically assessed in terms of non-committed surplus monsoon run off, which as per present water resource development scenario is going unutilised. This component can be assessed by analyzing the monsoon rainfall pattern, its frequency, number of rainy days, maximum rainfall in a day and its variation in space and time. The variations in rainfall pattern in space and time, and its relevance in relation to the scope for artificial recharge to sub-surface reservoirs can be considered for assessing the surplus surface water availability.

“Hard” data (i.e., published and available to all stakeholders) should be used as much as possible; “soft” data (i.e., indirect evidence or the informed opinion of experts) should be avoided and only used as a last resort.

# Applicability (Sectoral Scopes)

The UWR RoU Program deals with the following sectoral RoU scopes:

|             |                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RoU Scope 1 | <p>Measures which enhance the sustainable yield in areas where over-development has depleted the aquifer.</p> <p>Measures involving soil moisture in agricultural settings that reduce the need for irrigation by optimizing water use and retention in the soil. Activities that involve agricultural irrigation efficiency measures.</p> <p>Measures involving drip and/or smart irrigation systems.</p>                |
| RoU Scope 2 | <p>Measures for conservation and storage of unutilized water for future requirements including freshwater ecosystems and wetlands. Improved or maintained water-related habitat. Water body restoration and/or protection.</p>                                                                                                                                                                                            |
| RoU Scope 3 | <p>Measures that improve the quality of existing ground water through dilution with rainwater runoff. Stormwater best management practices (BMPs) and measures which are used to intercept and slow runoff, helping to reduce flooding risk and improve water quality.</p>                                                                                                                                                |
| RoU Scope 4 | <p>Measures that remove bacteriological and other impurities from <i>seawater*</i>, sewage/wastewater contaminated water bodies or other contaminated water bodies, so that water is made suitable/fit for re-use and recycling purposes. The water bodies are outside the project's fenced boundary.</p>                                                                                                                 |
| RoU Scope 5 | <p>Conservation measures taken to recycle and/or reuse water, spent wash, wastewater etc across or within specific industrial processes and systems, including wastewater recycled/ reused in a different process, but within the same site or location of the project activity. Recycled wastewater used in off-site landscaping, gardening or tree plantations/forests activity are also eligible under this Scope.</p> |

*\*\*Desalination plants using seawater are eligible only if the project activity is powered by renewable energy and clear documentation exists on brine management and scientific data is provided that there is no net harm to the local marine ecosystem.*

## UWR Reference Guide

UWR Project Developers/Proponents or Sellers **from India**, shall use a combination of the following available guides and manuals to develop, select default data values or factors in the PCNMR for their project activity:

- (a) Rainwater Harvesting and Conservation Manual, 2019 ([link](#)) ,
- (b) Guide on Artificial Recharge to Ground Water ([link](#))
- (c) Rainwater Harvesting Techniques To Augment Ground Water ([link](#))
- (d) Manual on Artificial Recharge of Groundwater ([link](#))
- (e) IS 15797: 2008 ([link](#)) and
- (f) Water Data Guide ([link](#))
- (g) Ramsar Site Information for Wetlands ([https://rsis.ramsar.org/ris-search/?f\[0\]=regionCountry\\_en\\_ss%3AIndia](https://rsis.ramsar.org/ris-search/?f[0]=regionCountry_en_ss%3AIndia))
- (h) Volumetric Water Benefit Accounting 2.0: Guidance for implementing, evaluating, and claiming volumetric water benefits of water stewardship projects, Appendix C. Guidance for indicator and method selection, (<https://doi.org/10.46830/wrigb.23.00112>)

**Projects outside India can use data available based on official publications or country specific data sets.**

## Approved Project Activities (Positive List)

- New private/non-state wetland/s, revival and/or restoration of degraded **state notified** wetlands as per **Ramsar Sites Annotated List** (Please refer to UWR Wetland Guidance Document)
- Freshwater ecosystems such as wetlands and **artificial water bodies such as reservoirs.**
- Percolation tanks with associated recharge shafts.
- Artificial recharge through lateral shafts with associated injection wells.
- Different types of artificial recharge structures such as sub-surface dykes, Nalla bunds, tank excavation and minor irrigation tanks that store the excess monsoon run off on the surface which other than supplying water for irrigation are also used to recharge the shallow unconfined aquifer to create additional subsurface storage for further utilisation.
- Sub surface barriers with associated gravity head inverted wells.
- Roof top / paved area rainwater runoff diversion into injection tubewell or well or tank.
- Replenishment of ground water reservoirs through artificial recharge by rainwater harvesting which involves inducing, collecting, storing and conserving local surface runoff.
- Gabion and check dam structures across streams. Construction of artificial recharge of stagnant water in depressions recharge shafts piercing through impermeable clay horizons.
- Taanka traditional rainwater harvesting technique.
- Panam keni type wells.
- Johad (small earthen check dam) system to conserve and recharge ground water.
- Kund system with associated underground well.
- Baoli harvesting system with associated drainage systems.
- Nadi pond system for rainwater harvesting.
- Zabo rainwater harvesting system, Jackwell bamboo interconnected rainwater harvesting systems, Traditional ramtek model of rainwater harvesting system.
- Eri (tank) system of rainwater harvesting.
- Desalination systems using seawater **are eligible only if they meet all** of the following:
  - *the project activity is powered by 100% renewable energy, and*
  - *the brine generated by the desalination process or other types of waste, is not released into the surrounding environment causing damage to the marine ecosystem in the vicinity of the project activity.*
- All types of water purifications systems creating potable drinking water from previously untapped water resources.

- All soil moisture agricultural practices that reduce the need for irrigation by optimizing water use and retention in the soil.
- Use of smart technology/ies that optimize irrigation based on crop water needs and weather conditions.
- Utilizing systems like sprinklers or drip irrigation.
- Utilizing treated wastewater for irrigation can reduce reliance on freshwater resources.
- Innovative irrigation practices within the agricultural sector that enhances water efficiency, gaining an economic advantage while also reducing environmental burdens.
- Improved or maintained water-related habitat.
- Plugging gullies or channels or installing weirs to maintain or improve groundwater levels.
- Wetland restoration or creation activities such as beaver dam analogs or floodwater diversion onto farmland or floodplains can enhance recharge by ponding and recharging a portion of the increased volume of water stored or ponded.
- Agricultural irrigation efficiency measures.
- Operational efficiency measures, leak detection and repair, and consumer use efficiency measures such as low flow fixtures, agricultural water demand reduction measures involving surface water and groundwater resources.
- Green or gray infrastructure such as rain gardens, bioswales, stormwater detention or retention ponds, pond dredging, pond desilting, drainage water management, blind inlets, and other interventions designed to capture runoff.
- Green infrastructure activities including constructed wetland treatment systems, bioretention basins, and others.
- Process-based restoration; wet meadow restoration; beaver dam analogs; water level management for habitat, wetland, or peat bog protection or restoration; wetland creation; and others.
- Sustainable drainage systems, check dams, infiltration basins, infiltration wells, infiltration trenches, infiltration shafts, and other activities that facilitate increased recharge.
- Increased water availability via new or alternative sources of water supply for irrigation or domestic use (including drinking handwashing, bathing, and cleaning).
- Increased recharge, restoration and creation activities for wetlands or other aquatic habitats that store water, inclusive of invasive species removal and dredging, among others.

# . Baseline methodology

## **Project boundary**

The project boundary includes the physical, geographical site(s) of:

- (a) The artificial recharge installation;
- (b) Water conservation or management systems (including centralized purification plants where applicable);
- (c) Systems that recover and/or recycle wastewater or unutilized water.

## **Baseline scenario**

The baseline scenario for all RoU Scopes is the situation where, in the absence of the project activity must include one or more of the following:

- unutilized water flows uncollected into surrounding drains and/or
- unutilized water is not conserved/treated/recycled and/or
- unutilized water is not recharged and/or
- unutilized water is not harvested into a well/aquifer/sub-surface structure/above-ground storage tank/collection chamber, and/or
- water is extracted from multiple bore wells within the project boundary which would have depleted the local groundwater resources (aquifers) and/or
- water is diverted from existing safe drinking water resources from the surrounding areas

**Baseline scenario, if not directly measurable, is calculated by using one of the following options:**

Option 1:

**Harvested water or Volume of water utilized (m<sup>3</sup>) = Area of Catchment/Roof/Collection Zone (m<sup>2</sup>) X Amount of rainfall (mm) X Runoff coefficient .**

Option 2:

**Harvested/Recycled unutilized water or Volume of sea water utilized (m<sup>3</sup>) = Quantity of treated or recycled water in liters treated or harvested or volume of the artificial holding tank (1m<sup>3</sup> = 1000 liters).**

**Removals:** Evapotranspiration for the vintage period should be taken into account for conservative estimates. Data can be obtained here <https://indiawris.gov.in/wris/#/evapotranspiration> or can be cross referenced with the UWR Water Data guide in the UWR document section.

**Removals:** Recharge Uncertainty as per Section 12.1 in the PCNMR and Evapotranspiration for the vintage period should be taken into account for conservative estimates. Water Data can be obtained here <https://indiawris.gov.in/wris/#/evapotranspiration> or Water Data (pdf) under the Documents Section on [www.uwaterregistry.io](http://www.uwaterregistry.io)

Option 3: Other baseline calculations scenarios

### **Aquatic habitat restoration**

For activities that restore aquatic habitat (e.g., barrier removal, reconnection of side channels, dam reoperation, or process-based restoration) the RoUs can be determined based on the volume provided for aquatic habitat. This method requires that the user determine the relevant period of ecological significance based on the local context. For example, the period may be based on the provision of critical low flows during the dry season to maintain enough water in the habitat to sustain the local biodiversity or provide minimum flows needed for spawning, rearing, or overwintering. Documentation should be provided from a credible source to justify the selected period of ecological significance and the volume of water required to sustain the habitat. To minimize subjectivity when identifying the period of ecological significance, the user should focus on the most critical threshold for the species and/or habitat being restored.

First, the annual average volume provided is calculated for the without-project and with-project conditions.

**Volume provided = Minimum flow during period of ecological significance for target species × Flow duration**

This conservative approach may be used when data are not readily available to support a more detailed quantification.

**RoUs = Volume provided = Impounded volume<sub>without-project</sub> – Channel volume<sub>with-project</sub>**

The ROUs is then quantified as the difference in volume provided between the two conditions over an annual period.

This method applies when the status of the habitat under the without-project conditions is insufficient to sustain the identified species of concern (e.g., identified threatened, endemic, or sensitive species in the watershed) and/or the habitat for the relevant time period according to the local context and guidelines. The activity under the with-project conditions must also demonstrate a positive change to the status of the habitat that provides sufficient water volume to

sustain the identified species and/or habitat according to the local context and guidelines. Target species can be identified by local or regional experts (e.g., fisheries scientists, researchers) or published studies or literature. Similarly, appropriate resources may be consulted to determine the minimum flows. For example, if the project improves habitat for migratory fish, the local context and guidelines could be determined by subject matter experts or other credible local institutions to help inform the minimum flow requirements for the fish species to travel upstream. In some cases, the restoration project may benefit more than one species. The RoU calculation can consider a longer period of ecological significance to encompass multiple species.

## Barrier removal

For activities that involve removing a barrier to free up an impounded volume and contribute to the natural flow and habitat function, a simple pathway to assess the RoUs is to calculate the volume of water no longer impounded.

The table below shows the inputs required for barrier removal activities.

| Required inputs for barrier removal activities |                                                                                                                   |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| VARIABLE                                       | INPUT                                                                                                             |
| Impounded volume                               | The volume of water impounded behind the barrier                                                                  |
| Channel volume                                 | The volume in the portion of the channel in the same footprint of the impounded volume, following barrier removal |

This conservative approach may be used when data are not readily available to support a more detailed quantification.

$$\text{RoUs} = \text{Volume provided} = \text{Impounded volume}_{\text{without-project}} - \text{Channel volume}_{\text{with-project}}$$

## Operational efficiency measures, leak repair, irrigation canal piping, and irrigation water reuse

Several types of activities can reduce the volume of water withdrawn from a source (i.e., surface water or groundwater), including operational efficiency measures, leak repair, irrigation canal piping, and water reuse.

The reduced withdrawal volume is calculated as the difference in withdrawal volume for the with-project condition compared to the without-project condition. The without-project condition represents the withdrawal before the activity is implemented.

The with-project condition represents withdrawal after the activity is implemented.

If metered or monitored data are not available, the withdrawal volume can be estimated.

$$\text{RoUs (m}^3\text{)} = \text{Withdrawal}_{\text{without-project}} - \text{Withdrawal}_{\text{with-project}}$$

### Consumption method

For activities that reduce consumptive demand including agricultural activities such as irrigation efficiency improvement measures that convert from less efficient irrigation methods (such as flood irrigation) to more efficient irrigation methods (such as drip irrigation), the reduced consumption is calculated as the difference in consumption for the with-project condition compared to the without-project condition:

$$\text{RoUs (m}^3\text{)} = \text{Consumption}_{\text{without-project}} - \text{Consumption}_{\text{with-project}}$$

Activities that involve agricultural irrigation efficiency measures are less straightforward and may encompass a wide range of projects with varying levels of complexity. Either the Reduced Consumption or Reduced Withdrawal method is applicable based on the local context. The following simple cases offer examples:

- Case 1: Irrigated cropland is in an area with competing demands for existing water resources and the water is tightly allocated. Improved irrigation efficiency measures are implemented with the objective of reducing irrigation water applied. In this context, the Reduced Withdrawal approach is applicable.
- Case 2: Irrigated cropland relies on a water source that is already scarce (e.g., depleted groundwater), and the existing irrigation method results in excessive non-beneficial consumption (i.e., water evaporated and not used by the crop). Improved irrigation efficiency measures are implemented to promote the sustainable use of the scarce water resource through a reduction in non-beneficial consumptive use. In this context, the Reduced Consumption approach is applicable.

The above examples illustrate that improved irrigation efficiency measures are adopted in both cases, but either the Reduced Consumption or Reduced Withdrawal method is applicable depending on the project objective and local context.

If the context is less clear, the Reduced Consumption method will provide a conservative estimate of the RoUs.

For activities that involve improving agricultural irrigation efficiency at a farm, the withdrawal is based on the volume of irrigation water applied. The source of irrigation water can be either surface or groundwater.

### **Withdrawal volume = Irrigation water applied**

Some irrigation efficiency improvements (e.g., lining of distribution canal) may reduce withdrawals at the point of irrigation diversion. For these types of activities, the RoUs can be based on the withdrawal volumes at the point of diversion. The withdrawal volume can be based on metered or monitored data or estimated if direct monitoring is not available. For surface water withdrawals, the water applied can be estimated based on the diversion flow rate and the duration of diversion. For groundwater withdrawals, the water applied can be estimated based on the pumping rate and the duration of pumping. The reduced withdrawal is calculated as the difference in irrigation water applied between the without-project and with-project conditions. The RoUs are calculated as the decrease in withdrawal volume.

The Consumption method adjusts the withdrawal volume to subtract return flows. Consumption is estimated based on withdrawal volume and adjusted to account for return flow fraction.

Return flow fraction, expressed as a percentage, is the fraction of the withdrawal volume that is not consumed and is returned to the source.

The reduced consumption volume is calculated as the difference in consumption volume between the withproject and without-project conditions.

The RoUs are calculated as the decrease in consumption volume:

$$\text{Consumed volume} = (\text{Withdrawal volume}) \times (1 - \text{Return flow fraction})$$

As noted above, return flows are the portion of water withdrawn that is returned to the source through percolation or surface runoff. The return flows may enter the same water body either at the location where the water is withdrawn or at another location downstream (or upstream); in this latter case (another location), the return flow fraction must be supported with available information as shown in the table below:

### **Required inputs for agricultural irrigation activities**

| EQUATION          | VARIABLE                            | INPUT                                                                                                      |
|-------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------|
| Withdrawal volume | Diversion flow rate or pumping rate | Average monthly diversion flow rate or pumping rate (other relevant time scales may be used, if available) |
|                   | Duration of diversion               | Number of days during which diversion occurs                                                               |
| Consumed volume   | Withdrawal volume                   | Calculated based on diversion flow rate or pumping rate and the duration of diversion volume               |
|                   | Return flow fraction                | Return flow fraction based on irrigation and crop type                                                     |

Return flows vary with crop and irrigation type and can be measured or estimated using other appropriate resources (i.e., literature, local studies, consultation with subject matter experts).

## Leak detection and repair projects

For activities involving leak detection and repair, the RoUs are calculated based on the volume lost from leaks before and after leak detection and repair. For building-scale projects, this volume represents reduced withdrawal from the source. For utility-scale projects, this volume represents reduced non-revenue water. For the purpose of this method, non-revenue water refers to physical losses due to leaks in the distribution system. The RoUs are calculated by comparing leak volume for the with-project and without-project conditions (the withoutproject condition describes the leak volume before project implementation and the with-project condition represents leak volume after detection and repair):

$$\text{RoUs} = \text{Leak volume reduction} = \text{Leak volume}_{\text{without-project}} - \text{Leak volume}_{\text{with-project}}$$

The table below shows that the leak volumes for the withoutproject and with-project conditions should be based on metered data where possible, particularly in large-scale utility distribution systems. When metering is not feasible, the leak volumes can be estimated based on the number of leaks and the average loss rate per leak.

### Required inputs for leak detection and repair projects

| VARIABLE                               | INPUT                                                                                                      |
|----------------------------------------|------------------------------------------------------------------------------------------------------------|
| Leak volume <sub>without-project</sub> | Metered or estimated leak volume without the project (i.e., before leak detection and repair intervention) |
| Leak volume <sub>with-project</sub>    | Metered or estimated leak volume with the project (i.e., after leak detection and repair intervention)     |

## Appendix A.

### UWR RoU Project Eligibility General Criteria

#### Criteria and guidance for evaluating projects eligible to generate Rainwater Offset Units (RoUs)

- **A.1 Purpose**

This appendix establishes the eligibility criteria that a water project must satisfy before it can be approved to generate Rainwater Offset Units (RoUs) under the Universal Water Registry (UWR) Standard.

The criteria are intended to ensure that eligible projects address a relevant water challenge, generate a quantifiable water benefit, use a defensible assessment method, consider affected stakeholders, provide for ongoing monitoring, and avoid unacceptable adverse consequences.

Project eligibility is distinct from verification and RoU issuance. Satisfying these criteria establishes that a project may be considered for approval under the applicable UWR methodology; it does not, by itself, establish the volume of eligible benefits or guarantee the issuance of RoUs.

- **A.2 Project eligibility criteria**

Criterion 1. Established pathway for quantifying a water benefit

The project must have a technically defensible pathway for measuring or estimating the water benefit attributable to the activity. The assessment must identify the intended outcome, the relevant water-benefit indicator, the project boundary, the calculation method and the evidence required to substantiate the result.

The project must demonstrate how its activities contribute to a beneficial water-related outcome compared with an appropriate baseline or without-project condition, where applicable to the selected scope.

#### How to demonstrate compliance

The project developer shall provide:

- A description of the project activity and its intended water benefit.
- The applicable **UWR scope** and approved quantification methodology.
- The project boundary, measurement period and relevant water source.
- Baseline information and supporting data.

- Calculations, assumptions and data sources sufficient for independent assessment.
- An explanation of how uncertainty, losses and potential overlap with other claimed benefits are addressed.

The calculation method shall be appropriate to the activity.

Example:

Runoff volume can be calculated annually by multiplying the sum of daily runoff depth (mm) and surface area (m<sup>2</sup>).

## **Criterion 2. Relevance to a documented water challenge**

The project must address a water challenge relevant to its location and intended beneficiaries. The assessment should consider the local hydrological setting, the condition and use of relevant water resources, and the needs of communities and other entities that depend on those resources.

The project developer shall explain why the proposed intervention is appropriate to the identified challenge and how its intended outcome relates to local water priorities.

How to demonstrate compliance

The project developer shall provide:

- The project location and relevant hydrological or catchment context.
- Available information on local water availability, groundwater conditions, rainfall, water demand or other relevant challenges.
- Identification of intended beneficiaries and other relevant water users.
- Evidence supporting the relationship between the proposed activity and the identified challenge.
- Relevant local studies, public records, technical assessments or stakeholder inputs, where available.

The level of assessment shall be proportionate to the project scale, complexity and potential risk.

## **Criterion 3. Stakeholder support and consideration of affected parties**

The project may identify relevant stakeholders and consider the interests of people and entities that depend on, manage or may be affected by the water resource. The assessment shall consider whether the project could transfer water-related burdens from one group to another.

How to demonstrate compliance

The project developer may document, as appropriate to the project's scale and risk:

- Relevant communities, water users, local authorities and resource managers.
- Consultation undertaken or other evidence used to understand local concerns.
- Potential conflicts over water access, allocation or resource use.
- Measures proposed to address material concerns and minimise adverse effects.
- Any outstanding issues that could affect project eligibility or implementation.

Where a project presents significant social, environmental or reputational risks, more detailed consultation and assessment may be required.

#### **Criterion 4. Demonstrable benefit beyond the without-project condition**

The project must establish a credible basis for determining the water benefit attributable to the intervention, rather than simply counting all water associated with the project.

The assessment shall consider what would reasonably have occurred without the project, existing activities and commitments, and whether the claimed outcome can be attributed to the proposed intervention under the applicable UWR methodology.

Where an activity is required by law or regulation, the project developer shall disclose that obligation and demonstrate how the activity meets the applicable UWR eligibility and additionality requirements. Legal compliance alone shall not be treated as proof of an additional water benefit.

How to demonstrate compliance

The project developer shall provide:

- A documented baseline or without-project scenario appropriate to the selected methodology.
- Evidence of existing water-management practices and relevant legal obligations.
- An explanation of how the intervention changes the water outcome.

- Supporting data and calculations that distinguish the attributable benefit from pre-existing conditions or unrelated activities.
- Disclosure of relevant public funding, other project sponsors and existing environmental-credit claims.

UWR shall assess additionality and attribution according to the applicable methodology; neither shall be assumed solely because a project produces a measurable water volume.

### **Criterion 5. Established monitoring and reporting arrangements**

The project must have a feasible plan to monitor its implementation and assess whether it continues to deliver the intended water benefit over the period relevant to its RoU claims.

The plan shall identify the information needed to substantiate reported volumes, the methods and frequency of monitoring, the parties responsible for collecting and maintaining records, and the arrangements for reporting project performance.

How to demonstrate compliance

The project developer shall submit a monitoring and reporting plan specifying:

- Indicators and parameters to be monitored.
- Data sources, measurement methods and calculation procedures.
- Monitoring frequency and reporting periods.
- Responsibilities for data collection, quality control and record retention.
- Maintenance and performance checks, where relevant.
- Procedures for reporting deviations, interruptions, underperformance or material changes.
- Arrangements for independent verification in accordance with UWR requirements.

Monitoring arrangements shall be proportionate to the project's type, scale, duration and uncertainty. Where estimated rather than directly measured volumes are used, the methodology and assumptions shall be documented.

### **Criterion 6. Assessment and management of trade-offs and unintended impacts**

The project must be assessed for material adverse effects that could undermine its intended water benefit or harm people, ecosystems or other water users.

The assessment should consider relevant hydrological, environmental and social trade-offs, including whether an intervention may reduce water availability elsewhere, affect water quality, alter natural flows or create competing demands on a shared resource.

How to demonstrate compliance

The project developer shall:

- Identify material potential adverse effects and trade-offs.
- Explain how identified risks will be avoided, reduced or managed.
- Disclose material residual risks and relevant uncertainties.
- Establish appropriate monitoring or corrective measures where significant risks remain.

Projects presenting unacceptable adverse effects shall not qualify unless the relevant concerns can be resolved to the satisfaction of UWR under the applicable programme requirements.

- **A.3 Eligibility assessment and evidence**

UWR shall assess the information submitted against all six criteria, together with the applicable project scope and quantification methodology.

The assessment may result in:

1. Eligible for further assessment: the criteria are met and the project may proceed to the next applicable stage.
2. Additional information required: specified gaps must be addressed before a registration or RoU issuance decision can be made.
3. Not eligible: one or more material criteria are not met, or the project presents unresolved issues that prevent approval.

Approval of project eligibility does not constitute independent verification of achieved water benefits and does not automatically authorise RoU issuance. Quantification, verification, issuance, registry recording and retirement remain subject to the applicable UWR requirements.

- **A.4 Relationship with VWBA 2.0**

This appendix is informed by principles addressed in the Volumetric Water Benefit Accounting (VWBA) 2.0 guidebook, particularly its Appendix A project eligibility criteria.

UWR applies these principles within its own programme structure and approved methodologies. Any adaptation or additional UWR requirement shall be documented in the relevant

methodology or programme provision. Reference to VWBA 2.0 does not imply that UWR has been endorsed, certified or formally approved by the authors of that guidebook.

Where a project methodology specifies more detailed eligibility requirements, those requirements shall be applied together with this appendix. In the event of a conflict, the governing UWR Standard and applicable approved methodology shall determine eligibility.

**SAMPLE**



## **Project Concept Note & Monitoring Report (PCNMR)**

**Project Name :** \_\_\_\_\_

**UWR RoU Scope:** \_\_\_\_\_

**Monitoring Period:** DD/MM/YYYY-DD/MM/YYYY

**Crediting Period:** YYYY-YYYY

**(Optional) UNDP Human Development Indicator:** \_\_\_\_\_

**(Optional) National Water Security Index:** \_\_\_\_\_

## A.1 Location of Project Activity

|                                 |                                                                                                                                                 |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| State                           |                                                                                                                                                 |
| District                        |                                                                                                                                                 |
| Block Basin/Sub Basin/Watershed | Please refer to example for India-<br><a href="http://cgwb.gov.in/watershed/basinsindia.html">http://cgwb.gov.in/watershed/basinsindia.html</a> |
| Lat. & Longitude                |                                                                                                                                                 |
| Area Extent                     |                                                                                                                                                 |
| No. of Villages/Towns           |                                                                                                                                                 |

\*Provide maps where applicable

## A.2. Project owner information, key roles and responsibilities

It is important that the roles and responsibilities are clearly documented here within the management plan including clear lines of accountability and reporting Project owner shall attest to the following and that owner:

- (a) owns the water user rights for the area within the project's boundary,
- (b) holds an uncontested legal land title for the project area within the project's boundary,
- (c) holds all necessary permits to implement the project or has applied for the same, AND
- (d) provides cost details of project implementation .

### A.2.1 Project RoU Scope

|                     |  |
|---------------------|--|
| PROJECT NAME        |  |
| UWR Scope:          |  |
| Date PCNMR Prepared |  |
|                     |  |

### A.3. Land use and Drainage Pattern

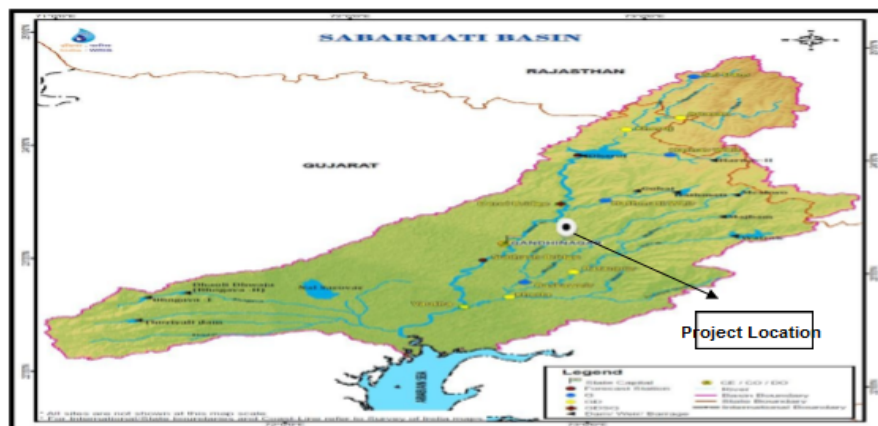
- (i) Cultivable & Non-cultivable Area Forest
- (ii) Urban
- (iii) Other

**Example:**

#### DRAINAGE PATTERN:

Different types of drainage and stream order are very important for understanding the infiltration and runoff of the water. The Study area falls in Sabarmati River basin. It is an inter-state river basin and is one of the 20 major river basins in India. It originates in the Aravalli hills of Rajasthan at an elevation of 762m above means elevate latitude  $24^{\circ}40'$  North and Longitude  $73^{\circ}20'$  E near the shrine of Ambe Bhavani. In the Rajasthan part, the basin extends over parts of Udaipur, Sirohi, Dungarpur, and Pali districts. In the Gujarat part, the basin extends over parts of six districts of Gujarat, namely, Sabarkantha, Banaskantha, Mehsana, Gandhinagar, Ahmedabad, and Kheda. The entire basin is divided into three sub basins, namely Dharoi, Hathmati, and Watrak. Sabarmati River Basin is one of the most severely water-stressed river basins in India, with problems of water availability and quality, and experiences competition and conflicts over water use between and within different sectors of water use.

#### -DRAINAGE MAP



Source: India-WRIS (Govt. of India)

The problems pose a serious threat to sustainability of the water system, other ecological systems, and the socio-economic processes that are dependent on the basin's water. These different types of drainage pattern mainly depend on the local geography, geology, structures and tectonics and also it depends on the slope of the area. The area is under the influence of Sabarmati River being the main recharging source & controlling the drainage pattern. The study area lies under the basin of Sabarmati river. Overall the drainage pattern of the area is dendritic.

## A.4. Climate

(i) Type of Climate

- Humid
- Sub-Humid
- Arid
- Semi-arid

## A.5. Rainfall

- (a) Average annual : \_\_\_\_\_ mm
- (b) No. of Rainy days: \_\_\_\_\_
- (c) Temperature: \_\_\_\_\_

**Example:**

*The project activity area experiences a hot to semi-arid climate. The summer season continues for about four months between March and June and the temperature rises as high as 45°C in the month of May and during winter it falls up to 10°C during December. The Ahmedabad dist. as a whole faces acute shortage of water due to frequent failure of monsoon creating drought like situation.*

*The area is highly favorable for setting the monsoon in the fourth week of June and ends in the month of September. The overall annual average rainfall of the area is 750 to 755 mm. During this period, all the streams & channels are flooded with water. The short-term average rainfall of the Ahmedabad City is 754 mm IMD (2000-2020) with about only 35 complete rainy days. The annual rainfall of the study area is tabulated in the Table no 1. During last 21 years period (2000-2020) maximum rainfall recorded was 1186 mm in the year 2010 & minimum was 382 mm in the year 2015.*

*The rainfall data also shows that during last 21 years only 10 years had received above normal annual rainfall and remaining period of the year received sub normal Rain. Rainfall plays an important role in the availability of groundwater in this region and it is a major source for groundwater recharge.*

**TABLE NO. I Annual Rainfall for last 21 years (2000 to 2020)**

| Year wise Rainfall of Ahmedabad City (in mm) |          |  |      |          |
|----------------------------------------------|----------|--|------|----------|
| Year                                         | Rainfall |  | Year | Rainfall |
| 2000                                         | 559      |  | 2011 | 717      |
| 2001                                         | 638      |  | 2012 | 674      |
| 2002                                         | 397      |  | 2013 | 1153     |
| 2003                                         | 683      |  | 2014 | 901      |
| 2004                                         | 814      |  | 2015 | 382      |
| 2005                                         | 802      |  | 2016 | 574      |
| 2006                                         | 1044     |  | 2017 | 1022     |
| 2007                                         | 965      |  | 2018 | 418      |
| 2008                                         | 664      |  | 2019 | 851      |
| 2009                                         | 464      |  | 2020 | 932      |
| 2010                                         | 1186     |  |      | 0        |
| AVERAGE RAI FALL IS—754MM                    |          |  |      |          |

## A.6. Ground Water

- (i) Description of aquifer: (Refer Water Data Guide under Documents on [www.uwaterregistry.io](http://www.uwaterregistry.io) or <https://indiawris.gov.in/wris/#/Aquifer> )
- (ii) Unconfined & confined aquifers
  - (a) Potable
  - (b) Brackish
  - (c) Saline
- (ii) Any special quality problem, (Seawater intrusion, pollution, high fluoride etc.).

### Additional Resource:

<http://jalshakti-dowr.gov.in/sites/default/files/MasterPlanForArtificialRechargeToGroundWater2020.pdf>

## A.7. Alternate methods

*Using base data on topography, rainfall, hydrogeology, aquifer situation and source water availability (if available), identify the methods which may be suitable and why the current method in the project activity was selected by the project proponent for rainfall harvesting.*

## A.8. Design Specifications

*For individual structure at different locations, please describe the design specifications of the implemented project activity. Please include flow charts and diagrams where needed.*

*Please describe parameters involved in estimation of quantity that has been diverted for artificial recharge, the time for which the unutilized/source water was available, the quality of source water and the pretreatment required (if any) and describe the conveyance system being used to bring the water to the recharge site.*

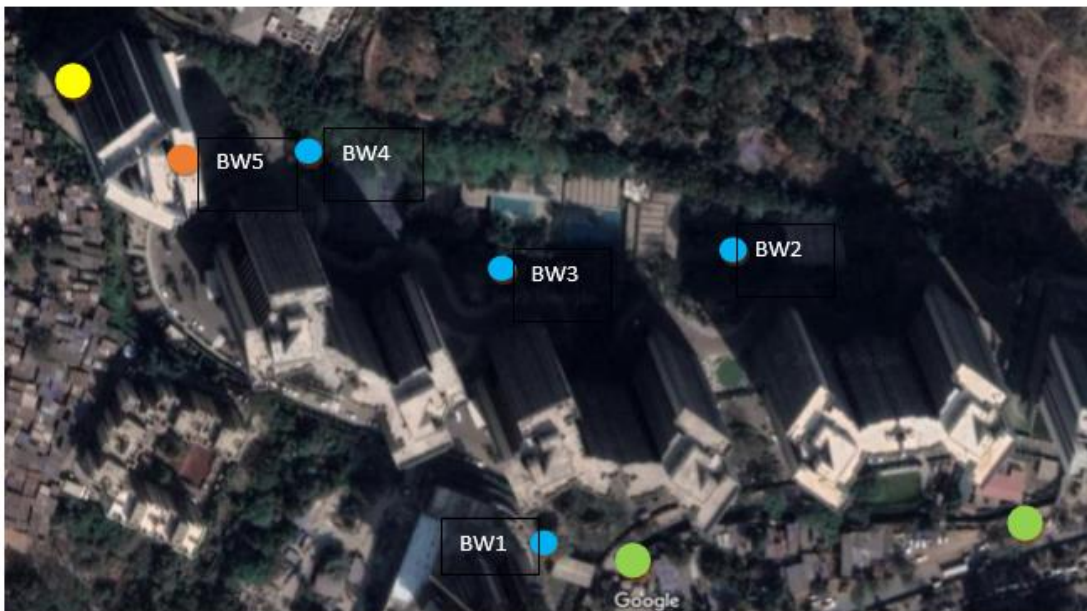
## A.9. Implementation Benefits to Water Security

*Describe the number of such types of artificial recharge structures needed to achieve or have been installed to meet the quantitative targets for the region or facility.*

### **Example 1:**

1. **Total plot area:** 48500 sq. mtrs.
2. **Constructed area:** 36000 sq. mtrs.
3. **Rooftop area:** 9000 sq. mtrs.
4. **No. of towers:** 7 with 27 floors each
5. **No. of apartments:** 1453
6. **Occupancy rate:** 90-95 %
7. **Primary source of water:**
  - a. Brihanmumbai Municipal Corporation line
  - b. Sewage Treatment Plant
  - c. Borewell
8. **No. of borewells:** 5 with depth of 250-300 ft. each
9. **No. of operational borewells:** 4
10. **Daily Water Requirement:**
  - a. 1100 KL for domestic
  - b. 500 KL for flushing

## MAPPING OF THE EXISTING BOREWELLS:



- Lowest point in the plot. It is still roughly 2 to 3 ft higher than road level. There is a big government nalla and storm water drain passing under property main gate.
- Highest point in the plot. Roughly 20 to 25 ft higher than road level.

### **Example 2:**

#### **NEED FOR RECHARGE:-**

The industrialization not only helps to strengthen the economy of the province but also affects the ecological and environmental balance of the area. In this situation the activity of artificial recharge to ground water is an important measure which is substantially beneficial, as this will help in storing the surplus rainwater in the form of ground water and in turn, arrest the decline of ground water level and degradation of its quality.

Natural replenishment of ground water reservoir is a slow process and is often unable to keep pace with the excessive and continued exploitation of groundwater resources in various parts of the country as well as in Gujarat State.

This has resulted in fast declining ground water levels and depletion of ground water resources. Artificial recharge efforts are basically aimed at augmentation of the natural movement of surface water into ground water reservoir through suitable civil construction techniques. Such techniques interrelate and integrate the source water to ground water reservoir and are dependent on the hydro- geological situation of the area concerned. Artificial recharge techniques aim at extending the recharge period in the post-monsoon season for about three or more months, resulting in enhanced sustainability of ground water sources during the lean season. The need and advantage of recharge is mentioned as under:

#### **Need**

- To overcome the inadequacy of waters to meet our demands.
- To arrest decline in ground water levels.

- To enhance availability of ground water at specific place and time and utilize rain water for sustainable development.
- To increase infiltration of rain water in the sub-soil; which has decreased drastically in urban areas due to paving of open area.
- To improve ground water quality by dilution.
- To improve ecology of the area by increase in vegetation cover, etc.

#### Advantages

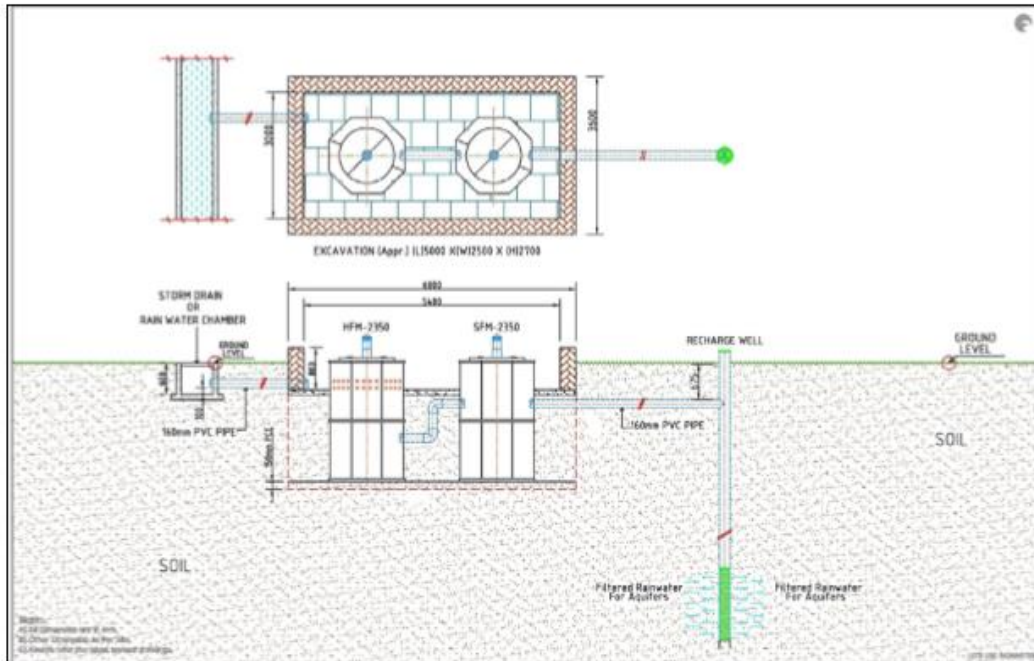
- ✓ Cost of recharge to sub-surface reservoir is lower than surface reservoirs.
- ✓ The aquifer serves as distribution system also.
- ✓ No land is wasted for storage purpose and no population displacement is involved.
- ✓ Ground water is not directly exposed to evaporation and pollution.
- ✓ Storing water underground is environment friendly.
- ✓ It increases the productivity of aquifer and boosts rise in ground water levels.
- ✓ It reduces flood hazards and soil erosion.
- ✓ Mitigates the effects of drought.
- ✓ The injection of fresh filtered rain water will raise the water table & ultimately the quantity of ground water in study area. This will reduce power consumption for its withdrawal.
- ✓ The fresh filtered rain water which will be diverted back to earth will be of around 100 to 200 ppm TDS only, improves the ground water quality of the given area.
- ✓ Rainwater which is pure with virtually no dissolved salts and minerals flushes salt build up from the soil and produces lush-green and healthy plants.

## METHODS AND TECHNIQUES OF RECHARGE/INSTALLED

### OPTION-I: SURFACE HARVESTING:

As per the rain harvesting plan, **xxx** has installed at **xxxxxxx** ground water recharge in decentralized pattern. Rainwater is captured directly from surface through **xxx** units. Method and techniques of **xxx** installation in open trench:

### SURFACE HARVESTING: - 1 NO HFM-2350 + 1 NO SFM-3475



## **A9.1 Objectives vs Outcomes**

*Describe in detail the objective of the project activity and the outcome post commencement of the activity. Provide diagrams and pictures where applicable for justification.*

### **Example**

**Objective:** *The major objective was to make the area water sufficient and poverty-free while increasing the water-harvesting capacity of the village. Ensuring participatory planning and educating women on watershed management.*

**Outcome:** *Farm ponds were made deeper than usual to conserve more rainwater and to ensure its availability for a longer duration. Changes in cropping pattern led to increased incomes. Higher yield and improved production of paddy. Emergence of fishery as a new livelihood activity, due to availability of sufficient water in farm ponds. Better yield in the lowlands due to water storage and seepage. Increased confidence of community members on farm ponds for irrigation. Vegetable farming using trellis proved profitable and many farmers now plan to grow more vegetables using water stored in the farm ponds.*

## **A9.2 Interventions by Project Owner / Proponent / Seller**

*Describe in detail the interventions carried out by the project activity to achieve the desired outcome.*

### **Example**

*Awareness and capacity-building efforts were undertaken to identify the problem faced by the community and the willingness to resolve it. A hydrogeological mapping of the area was done to identify the recharge area of the critical springs more accurately. A water budget for the village was designed based on the estimated amount available for use and demanded by the community. For demand management, protocols were established in the village to ensure the sustained impact of the interventions. Some of the protocols included recharge area protection, social fencing, crop-water analysis based farming, crop diversification, etc. and the outcome post commencement of the activity.*

## **A9.3 Baselines**

**Baseline scenario** for all RoU Scopes is the situation where, in the absence of the project activity, **must include one or more of the following:**

- *unutilized water flows **uncollected** into surrounding drains and/or*
- *unutilized water is **not conserved/treated/recycled** and/or*
- *unutilized water is **not recharged** and/or*

- *unutilized water is **not harvested** into a well/aquifer/storage tank, and/or*
- *water is **extracted from multiple bore wells** within the project boundary which would have depleted local groundwater resources, and/or*
- *water is **diverted from existing safe drinking water resources** from surrounding areas.*

## A.10. Feasibility Evaluation

*Briefly evaluate the economic feasibility of the Project activity undertaken or prior third party findings and result and recommendations of audit reports as applicable.*

## A.11. Ecological Aspects :

*Please provide a description of the potential environmental/ecological Problems being addressed by the project activity in terms of*

- *a) Inundation of habituated land*
- *b) Creation of water logging and vector disease prevention mitigation*
- *c) Deterioration of quality of groundwater*

## A.12. Recharge Aspects :

*Please document efforts taken to ensure that the Quality of Surplus Recharge water is clean, free from contamination and has compatibility with quality of native ground water in aquifers.*

### A.12.1 Solving for Recharge

*Ultimately, the volume of groundwater recharge benefit to the subbasin is the most critical aspect for such MAR activities. Groundwater recharge is quantified as the deep percolation of surface water applied during project implementation. Using a field-scale water budget, deep percolation can be calculated as the difference between all other inflows and outflows, per the equation below, with each other inflow and outflow being quantified:*

$$\text{Recharge} = \text{Rainfall} + \text{Surface Inflow} - \text{Evapotranspiration} - \text{Surface Outflow} - \text{Change in Storage}$$

**Evapotranspiration & Other Data: <https://datameet-pune.github.io/open-water-data/docs/open-water-data-paper.pdf> (or available under Documents Section- Water Data Guide)**

*Root Zone* = The root zone is comprised of the upper portion of the soil where water extraction by roots occurs, above the depth at which water infiltrates to the groundwater system. The depth to the bottom of the root zone varies by crop, but typically extends up to seven feet.

*Surface Inflow*= Surface inflows can be either directly measured or calculated from measured values. In fields directly served by metered lift pumps or metered gates, the volume of surface inflows to the field can be directly measured or calculated from totalized measurements. Typical accuracies of pipe flow measurements range from 1-12 percent. In fields that are indirectly supplied with surface water, surface inflows may need to be calculated from upstream and downstream flow measurements, or through theoretical or empirical equations relating available data to field surface inflows. For example, fields served from canals measured using weirs, or fields served from canals that deliver water to multiple locations downstream of a measurement device may require site-specific calculations to quantify surface inflows to a specific field. Low-cost in-field measurements can also be made by setting up flashboards at the measurement location and correlating the “runup” of an unsubmerged weir overflow on a flat weir stick to the flow rate using standardized equations. Typical accuracies of “runup” or indirect flow measurements may exceed 10 percent, depending on site conditions and the accuracy of measurement data.

To monitor surface inflows, project owners may record flow data, maintain irrigation logs, and maintain logs of any other parameters required to calculate field deliveries, depending on the unique conditions of their field. Project owners may also consider using mobile flow monitoring equipment to measure or verify surface inflows .

*Surface Outflows:* To monitor surface outflows, users may record flow data or water level data and maintain logs of any other parameters required to calculate outflows, depending on the unique conditions of their project activity. Pressure transducers and dataloggers may be used to automatically monitor water levels, or users may install wooden stakes to manually monitor water depths.

*Change in Storage* = The change in surface storage, or average ponded water depth, can be calculated from measured and observed changes in water surface levels at points throughout the project field. Over the annual project implementation period, **the total change in surface storage is typically zero,** provided that the surface of a field is dry and free of ponded water at the start and end of the project.

While the uncertainty of each inflow and outflow will vary based on field conditions and measurement devices, typical uncertainties associated with each water budget component are summarized in the table below. The uncertainty of deep percolation (i.e., recharge) can then be calculated from these other uncertainties, for example following the process described by Clemmens and Burt (1997). Users can use the following table to eliminate uncertainty from their estimates.

| Water Budget Component | Typical Estimated Uncertainty (%) | Description                                                                                                                    |
|------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Surface Inflow         | 1-12%                             | Typical range of accuracy from meters to minimum delivery accuracy requirements of delivery and diversion measurement devices. |
| Precipitation          | 2-20%                             | Typical range of accuracy from field-level rain gauges to extrapolation of local weather station data                          |
| Surface Outflow        | 1-20%                             | Typical range of accuracy from meters to estimated outflow relationships                                                       |
| Evapotranspiration     | 20.00%                            | Clemmens and Burt, 1997; typical accuracy based on free water surface evaporation coefficient.                                 |
| Change in Storage      | 15-25%                            | Estimated accuracy of change in storage calculation based on field scale water budget calibration to observed water levels.    |
| Deep Percolation       | 5-30%                             | Typical range of calculated accuracy from field-scale water budget results (fields ranging from 56 to 125 acres)               |

Other factors of uncertainty to consider when quantifying recharge are:

- ❑ Deep percolation does not immediately recharge the groundwater system. There is a time lag between when deep percolation occurs through the root zone and when that water reaches the saturated groundwater system.
- ❑ Subsurface inflows and outflows can occur through the groundwater system. While deep percolation may supply water to the groundwater system, that water may migrate away from the field along groundwater gradients.

Groundwater recharge can also be monitored and verified through groundwater level measurements at groundwater wells adjacent or near to the project activity. For instance,

groundwater level measurements collected before, during, and after implementation can potentially help verify that net recharge is occurring; especially in well-positioned wells with continuous monitoring.

### A.13. Quantification Tools

The following tools are recommended to be used to estimate the quantity of RoUs in the absence of tamperproof flow meters or systems that accurately quantify the volume in liters or m3 of water being harvested or conserved by the project activity.

#### Water Harvesting Potential

Water harvesting potential of any catchment area is to be calculated under this methodology for each given year that the RoU is being claimed. The total amount of water that is received from rainfall over an area is called the rainwater legacy of that area. The amount that can be effectively harvested is called the water harvesting potential.

The formula for calculation for harvesting potential or volume of water received or runoff produced or harvesting capacity is given as:-

$$\text{Harvesting potential [m3] or Volume of water utilized} = \text{Area of Catchment/Roof/Collection Zone (m2)} \times \text{Amount of rainfall (mm)} \times \text{Runoff coefficient .}$$

#### Runoff coefficient

Runoff coefficient for any catchment is the ratio of the volume of water that runs off a surface to the volume of rainfall that falls on the surface. Runoff coefficient accounts for losses due to spillage, leakage, infiltration, catchment surface wetting and evaporation, which will all contribute to reducing the amount of runoff. Runoff coefficient varies from 0.5 to 1.0. Rooftop rain water harvesting systems shall use the runoff coefficient equal to 1 as the rooftop area is totally impervious. Eco-climatic conditions (i.e. Rainfall quantity & Rainfall pattern) and the catchment characteristics are considered to be most important factors affecting rainwater harvesting potential .

| Type of Area            | Recommended Runoff Coefficient (K) |
|-------------------------|------------------------------------|
| Residential             | 0.3 to 0.5                         |
| Forest                  | 0.5 to 0.2                         |
| Commercial & Industrial | 0.9                                |

|                            |           |
|----------------------------|-----------|
| Parks and Farms            | 0.05- 0.3 |
| Asphalt or Concrete Paving | 0.85      |
| Road surface               | 0.8-0.9   |

#### Runoff Coefficient of Different Surfaces

| Different Surfaces       | Runoff Coefficient (K) |
|--------------------------|------------------------|
| Roof conventional (Flat) | 0.7 to 0.8             |
| Roof inclined (Sloping)  | 0.85 to 0.95           |
| Concrete/Kota Paving     | 0.6 to 0.7             |
| Gravel                   | 0.5 to 0.7             |
| Brick Paving             | 0.7                    |

#### Annual Rainwater harvesting Potential

Annual rainwater harvesting potential is given by  $V = K \times I \times A$

Where, V=Volume of water that can be harvested annually in liters .

$K$  = Runoff coefficient

$I$  = Annual rainfall in (mm)

$A$  = Catchment area in ( $m^2$ )

#### Rainfall intensity in the catchment area

The rainfall intensity of the area is to be found out from the local IDF -curves (intensity-duration frequency curve), if IDF-curve is not available, rainfall intensity default of 100 mm/hr shall be considered (this value is for tropical countries, with catchment areas smaller than 150 ha).

#### Analysis of the catchment area

The gradient of the catchment area, terrain configuration in the catchment area can be found out from the State Maps and the Runoff factors for the different terrain are given as below. Coefficient of Runoff Values for Different Terrains

| Terrain type | 'C' Coefficient of Runoff (Flat terrain) |
|--------------|------------------------------------------|
| Clayey soil  | 0.8 2                                    |

|                                |      |
|--------------------------------|------|
| Parking area                   | 0.75 |
| Roads and other concrete works | 0.85 |
| Green belts                    | 0.1  |

### Rainfall infiltration method

In areas where ground water level monitoring is not adequate in space and time, rainfall infiltration may be adopted. The norms for rainfall infiltration contributing to ground water recharge are evolved, based on the studies undertaken in various water balance projects in India. The norms for recharge from rainfall under various hydrogeological situations are recommended in the following table

**Table : Rainfall infiltration factor in different hydrogeological situations**

| S.No | Hydrogeological situation                                                                                                                                                                                                                          | Rainfall infiltration factor                                                                                                                                                                 |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Alluvial areas<br>a. Sandy Areas<br>b. Areas with higher clay content                                                                                                                                                                              | 20 to 25 percent of normal rainfall<br>10 to 20 percent of normal rainfall                                                                                                                   |
| 2    | Semi-Consolidated Sandstones<br>(Friable and highly porous)                                                                                                                                                                                        | 10 to 15 percent of normal rainfall                                                                                                                                                          |
| 3    | Hard rock area<br>a. Granitic Terrain<br>(i) Weathered and Fractured<br>(ii) Un-Weathered<br>b. Basaltic Terrain<br>(i) Vesicular and Jointed Basalt<br>(ii) Weathered Basalt<br>c. Phyllites, Limestones, Sandstones,<br>Quartzites, Shales, etc. | 10 to 15 percent of normal rainfall<br>5 to 10 percent of normal rainfall<br>10 to 15 percent of normal rainfall<br>4 to 10 percent of normal rainfall<br>3 to 10 percent of normal rainfall |

### Additional Guidance On Groundwater Recharge Estimates and Guidelines

UWR recommends following the estimates and guidelines outlined here <http://cgwb.gov.in/documents/Manual%20on%20Artificial%20Recharge%20of%20Ground%20Water.pdf>

Interim Report on Project wise Impact Assessment of Completed Demonstrative Artificial Recharge Projects of XI Plan (<http://cgwb.gov.in/Ar-reports.html>)

### Additional Guidance For Rooftop Rainwater Harvesting Systems:

In order to be conservative in the estimation of the quantity of rainwater harvested, RWH users of this methodology are advised to also refer to [IS 15797:2008 Indian Standard Roof Top Rain Water Harvesting](#) guidelines on estimation.

Table 1 can also be used for conservative estimates for Rooftop Rainwater Harvesting Systems:

**Table 1 Availability of Rain Water through Roof Top Rain Water Harvesting**

| Rainfall(mm)        | 100                                 | 200  | 300  | 400  | 500  | 600  | 800  | 1000 | 1200 | 1400  | 1600  | 1800  | 2000 |
|---------------------|-------------------------------------|------|------|------|------|------|------|------|------|-------|-------|-------|------|
| Roof top area (sqm) | Harvested water from Roof top (cum) |      |      |      |      |      |      |      |      |       |       |       |      |
| 20                  | 1.6                                 | 3.2  | 4.8  | 6.4  | 8    | 9.6  | 12.8 | 16   | 19.2 | 22.4  | 25.6  | 28.8  | 32   |
| 30                  | 2.4                                 | 4.8  | 7.2  | 9.6  | 12   | 14.4 | 19.2 | 24   | 28.8 | 33.6  | 38.4  | 43.2  | 48   |
| 40                  | 3.2                                 | 6.4  | 9.6  | 12.8 | 16   | 19.2 | 25.6 | 32   | 38.4 | 44.8  | 51.2  | 57.6  | 64   |
| 50                  | 4                                   | 8    | 12   | 16   | 20   | 24   | 32   | 40   | 48   | 56    | 64    | 72    | 80   |
| 60                  | 4.8                                 | 9.6  | 14.4 | 19.2 | 24   | 28.8 | 38.4 | 48   | 57.6 | 67.2  | 76.8  | 86.4  | 96   |
| 70                  | 5.6                                 | 11.2 | 16.8 | 22.4 | 28   | 33.6 | 44.8 | 56   | 67.2 | 78.4  | 89.6  | 100.8 | 112  |
| 80                  | 6.4                                 | 12.8 | 19.2 | 25.6 | 32   | 38.4 | 51.2 | 64   | 76.8 | 89.6  | 102.4 | 115.2 | 128  |
| 90                  | 7.2                                 | 14.4 | 21.6 | 28.8 | 36   | 43.2 | 57.6 | 72   | 86.4 | 100.8 | 115.2 | 129.6 | 144  |
| 100                 | 8                                   | 16   | 24   | 32   | 40   | 48   | 64   | 80   | 96   | 112   | 128   | 144   | 160  |
| 150                 | 12                                  | 24   | 36   | 48   | 60   | 72   | 96   | 120  | 144  | 168   | 192   | 216   | 240  |
| 200                 | 16                                  | 32   | 48   | 64   | 80   | 96   | 128  | 160  | 192  | 224   | 256   | 288   | 320  |
| 250                 | 20                                  | 40   | 60   | 80   | 100  | 120  | 160  | 200  | 240  | 280   | 320   | 360   | 400  |
| 300                 | 24                                  | 48   | 72   | 96   | 120  | 144  | 192  | 240  | 288  | 336   | 384   | 432   | 480  |
| 400                 | 32                                  | 64   | 96   | 128  | 160  | 192  | 256  | 320  | 384  | 448   | 512   | 576   | 640  |
| 500                 | 40                                  | 80   | 120  | 160  | 200  | 240  | 320  | 400  | 480  | 560   | 640   | 720   | 800  |
| 1000                | 80                                  | 160  | 240  | 320  | 400  | 480  | 640  | 800  | 960  | 1120  | 1280  | 1440  | 1600 |
| 2000                | 160                                 | 320  | 480  | 640  | 800  | 960  | 1280 | 1600 | 1920 | 2240  | 2560  | 2880  | 3200 |
| 3000                | 240                                 | 480  | 720  | 960  | 1200 | 1440 | 1920 | 2400 | 2880 | 3360  | 3840  | 4320  | 4800 |

Source: CENTRAL GROUND WATER BOARD MINISTRY OF WATER RESOURCES GUIDE ON ARTIFICIAL RECHARGE TO GROUNDWATER 2000

## Quantification

| Year (January 01, 2014 onwards)                                                                                                                                                                                                                                                                                        | RoUs (1 RoU = 1000 liters)/yr * |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| DD/MM/YYYY                                                                                                                                                                                                                                                                                                             | Number                          |
| Conservative Approach: The UWR RoU Verifier is recommended to apply a 10-50% uncertainty factor related to degree of uncertainty to the final quantity of RoUs calculated for vintage years 2014-2021. However, a more conservative approach to uncertainty may be selected by the RoU Verifier as per its discretion. |                                 |
|                                                                                                                                                                                                                                                                                                                        |                                 |

*\*All calculations of RoUs for **rooftop rainwater harvesting systems** should be rounded down against the lower of the two values (if any) between RoUs calculated and RoU values as per IS 15797:2008 for the given area of rooftop and rainfall received in the year (2014 onwards).*

**Estimated Net Runoff from an Impervious Catchment Surface Adjusted by its Runoff Coefficient (metric units) catchment area (m<sup>2</sup>) X rainfall (mm) X runoff coefficient = net runoff (liters)**

**EXAMPLE: In an area receiving 304 millimeters of rain a year, you have a rooftop catchment surface that is 15 meters long and 9 meters wide, and you want to know how much rainfall can realistically be collected off that roof in an average year.**

You want a conservative estimate of annual net runoff, so you use a runoff coefficient of 80% or 0.80. (Since the roof is a rectangular area, use the following calculation for catchment area as in Equation—catchment area (m<sup>2</sup>) = length (m) x width (m)—which is figured into the calculation below.

((length (m) X width (m)) x rainfall (mm) X 0.80 = net runoff (liters) (15 m x 9 m) x 304 mm x 0.80 = net runoff (liters) 135 m<sup>2</sup> x 304 mm x 0.80 = 32,832 liters

32,832 liters = net runoff

A realistic estimate of the volume of water that could be collected off this 15 meter by 9 meter roof in a year of average rainfall is 32,832 liters or 32 RoUs (since 1 RoU = 1000 liters)

**Example:**

**RAINWATER HARVESTING POTENTIAL:**

**Possible Rainwater Calculation of Water Volume @ Different Co-efficient at following Intensities/day: -**

IMD data over the past 13 years shows the highest seasonal rainfall, prior to 2019, was recorded in 2010 – 3,327.9 mm over four months (June to September). The annual average rainfall for Mumbai is 2,514mm, while the seasonal average is 2,317mm.

**Possible Rainwater Collection for The Total Plot Area @ 25mm Peak**

| Sr. No. | Area in Sq. mtrs. | Possible water collection per year @ 2514mm | Possible water collection @ 25mm peak | Co-efficient |
|---------|-------------------|---------------------------------------------|---------------------------------------|--------------|
| 1.      | 48500             | 60964 M <sup>3</sup>                        | 606 M <sup>3</sup>                    | 50%          |

**Possible Rainwater Collection for The Total Plot Area @ 50mm Peak**

| Sr. No. | Area in Sq. mtr. | Possible water collection per year @ 2514mm | Possible water collection @ 50mm peak | Co-efficient |
|---------|------------------|---------------------------------------------|---------------------------------------|--------------|
| 1.      | 48500            | 60964 M <sup>3</sup>                        | 1212 M <sup>3</sup>                   | 50%          |

**Possible Rainwater Collection for The Total Plot Area @ 75mm Peak**

| Sr. No. | Area in Sq. mtrs. | Possible water collection per year @ 2514mm | Possible water collection @ 75mm peak | Co-efficient |
|---------|-------------------|---------------------------------------------|---------------------------------------|--------------|
| 1.      | 48500             | 60964 M <sup>3</sup>                        | 1819 M <sup>3</sup>                   | 50%          |

**Possible Rainwater Collection for The Total Plot Area @ 100mm Peak**

| Sr. No. | Area in Sq. mtrs. | Possible water collection per year @ 2514mm | Possible water collection @ 100mm peak | Co-efficient |
|---------|-------------------|---------------------------------------------|----------------------------------------|--------------|
| 1.      | 48500             | 60964 M <sup>3</sup>                        | 2425 M <sup>3</sup>                    | 50%          |

## A.14. UWR Rainwater Offset Do No Net Harm Principles

Describe how the project activity accomplishes the following:

- Increase the sustainable water yield in areas where over development has depleted the aquifer
- Collect unutilized water or rainwater from going into storm drains or sewers
- Conserve and store excess water for future use
- Enhance local women's participation and professional development

## A.15. Scaling Projects-Lessons Learned-Restarting Projects

Please describe how the project can be scaled further and take into account existing integrated practices, as well as areas of duplication that might contribute to better water and urban management.

### Example:

*Efforts to introduce wastewater recycling for direct potable water supply have failed in many cities because of the perception that reclaiming drinking water from municipal effluent is generally unacceptable to the public. However, the experience in XYZ showed that with persistent, well-designed, and targeted communication to the public, this perception can be changed. The people of the village XYZ generally take pride in the fact that they are one of only a few villages in the world where direct potable water reuse is practiced. Furthermore, there is evidence to show that this is indeed a safe practice: in 5 years of recycling water for drinking water supply, the village has not had a single outbreak of waterborne disease linked to this practice.*

### Example:

*Stormwater harvesting for domestic use had to be abandoned at some sites as it turned out not to be the most cost-efficient option when the full range of costs and benefits were taken into account. However, the revenue from the sale of RoUs under the UWR Program has now meant that such stormwater harvesting abandoned earlier can be restarted.*

*It's proposed that in 2023, the PP will undertake 32 abandoned stormwater projects and the water will be supplied to gardens and sports clubs, totaling 1.4 million m<sup>3</sup> of water supply.*